Aristotle

Physics

Translated
With Introduction and Notes
By

C. D. C. Reeve

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For

W. E. W. St. G. C.

&

All at *TLG*.

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Preface

A worthwhile translation of the *Physics* must be accurate and consistent and be accompanied by sufficient annotation to make its contents accessible. Some of this annotation can consist, as it does here, of texts selected from other works of Aristotle, so that, while traveling through the region of the Aristotelian world the *Physics* describes, the reader can also travel through other regions of it, acquiring an ever widening and deepening grasp on the whole. But much of it must simply be explanatory, clarificatory, and interpretative. To make the journey as convenient as possible sequentially numbered endnotes take the place of footnotes and glossary entries, so that the information most needed at each juncture is available in a single location. The non-sequential reader, interested in a particular passage, will find in the detailed Index of Terms a guide to places where focused discussion of a term or notion occurs. The Glossary shows key Greek terms and their English equivalents. The Introduction describes the book that lies ahead, explaining what it is about, what it is trying to do, and how it goes about doing it. It is not a comprehensive discussion of all the important topics in the *Physics*, nor is it an expression of scholarly consensus on those it does discuss, but rather my own take on them. The same is true of many of the more interpretative notes. They are a place to start, not a place to finish—a first step in the vast dialectical task of coming to understand Aristotle for oneself. It is a reader willing to undertake this task that Aristotle requires and most rewards and that I have most had in mind.

I have benefited from the work of previous translators and commentators, especially David Ross, whose edition of the Greek text, commentary on it, and translation of it has been essential, and Pierre Pellegrin, whose excellent French edition has been a constant source of enlightenment. The various volumes devoted to the *Physics* in the Clarendon Aristotle Series have also often been helpful.

I am indebted, too, to David Riesbeck for his careful line reading and for his many useful and insightful comments, suggestions, and corrections.

I renew my thanks to ΔKE, the first fraternity in the United States to endow a professorial chair, and to the University of North Carolina for awarding it to me. The generous research funds, among other things, that the endowment makes available each year have allowed me to travel to conferences and to acquire books, computers, and other research materials and assistance, without which my work would have been much more difficult.

Finally and wholeheartedly, I again thank Deborah Wilkes, Liz Wilson, and all at Hackett, for their friendship and help.

Abbreviations

Aristotle

Citations of Aristotle's works are made to Immanuel Bekker, *Aristotelis Opera* (Berlin: 1831 [1970]), in the canonical form of abbreviated title, book number (when the work is divided into books), chapter number, page number, column letter, and line number. In the case of the *Physics*, however, the title of the work is usually omitted. An * indicates a work whose authenticity has been seriously questioned; ** indicates a work attributed to Aristotle but generally agreed not to be by him. The abbreviations used are as follows:

APo.	*Posterior Analytics*
APr.	*Prior Analytics*
Cael.	*De Caelo (On the Heavens)*
Cat.	*Categories*
DA	*De Anima (On the Soul)*
Div. Somn.	*On Divination in Sleep* (Ross)
EE	*Eudemian Ethics*
GA	*Generation of Animals*
GC	*On Coming to Be and Passing Away (De Generatione et Corruptione)* (Joachim)
HA	*History of Animals (Balme)*
IA	*Progression of Animals (De Incessu Animalium)*
Int.	*De Interpretatione*
Juv.	*On Youth and Old Age, Life and Death, and Respiration* (Ross)
LI	*On Indivisible Lines***
Long.	*On Length and Shortness of Life* (Ross)
MA	*Movement of Animals* (Nussbaum)

Mem.	*On Memory* (Ross)
Mete.	*Meteorology*
NE	*Nicomachean Ethics*
PA	*Parts of Animals*
Ph.	*Physics*
Po.	*Poetics*
Pol.	*Politics*
Pr.	*Problems**
Rh.	*Rhetoric*
SE	*Sophistical Refutations*
Sens.	*Sense and Sensibilia*
Somn.	*On Sleep*
Top.	*Topics*

I cite and translate the *Oxford Classical Texts* (OCT) editions of these works, where available, otherwise Bekker or the editions noted:

Balme, D. *Aristotle: Historia Animalium* (Cambridge, 2002).
Joachim, H. *Aristotle on Coming-to-Be and Passing-Away* (Oxford, 1926).
Mayhew, R. *Aristotle: Problems* (Cambridge, Mass., 2011).
Nussbaum, M. *Aristotle's De Motu Animalium: Text with Translation, Commentary, and Interpretative Essays* (Princeton, 1978).
Rose, V. *Aristotelis Fragmenta*, 3rd ed. (Leipzig, 1886).
Ross, D. *Aristotle Parva Naturalia* (Oxford, 1955).

Plato

Chrm.	*Charmides*
Euthphr.	*Euthyphro*
Lg.	*Laws*
Phd.	*Phaedo*
Phlb.	*Philebus*
Prm.	*Parmenides*
Phdr.	*Phaedrus*

Prt.	*Protagoras*
Rep.	*Republic*
Tht.	*Theaetetus*
Ti.	*Timaeus*

Translations of Plato in the notes are based on those in J. M. Cooper, ed., *Plato: Complete Works* (Indianapolis, 1997) and on my *Trials of Socrates* (Indianapolis, 2002) and *Plato: Republic* (Indianapolis, 2004).

Other Abbreviations and Symbols

Apostle = H. Apostle, *Aristotle's Physics: Translated with Commentaries and Glossary* (Bloomington, 1969).

Baltussen = H. Baltussen, M. Atkinson, M. Share, I. Mueller, *Simplicius: On Aristotle Physics 1.5–9* (London, 2012).

Barnes = J. Barnes, *The Complete Works of Aristotle: The Revised Oxford Translation* (Princeton, 1984).

Campbell I–V = D. Campbell, *Greek Lyric* (5 vols., Loeb, 1991–1993).

Chantraine = P. Chantraine, *Dictionnaire Étymologique de la Langue Grecque* (Paris, 1968).

Charlton = W. Charlton, *Aristotle's Physics Books I and II* (Oxford, 1970).

Coope = U. Coope, *Time for Aristotle: Physics IV.10–14* (Oxford, 2005).

Cooper = J. Cooper, "Aristotelian Infinites," *Oxford Studies in Ancient Philosophy* LI (Winter, 2016): 160–206.

DK = H. Diels and W. Kranz, eds., *Die Fragmente der Vorsokratiker,* 6th ed. (Berlin, 1951).

Dover = K. J. Dover, *Aristophanes: Frogs* (Oxford, 1993).

Graham = D. Graham, *Aristotle Physics Book VIII* (Oxford, 1999).

Hardie & Gaye = R. Hardie and R. Gaye, *Physica* in D. Ross (ed.), *The Works of Aristotle,* Vol. II (Oxford, 1930).

Heath = T. Heath, *Mathematics in Aristotle* (Oxford, 1949).

Hussey = E. Hussey, *Aristotle's Physics Books III and IV* (Oxford, 1983).

Kock = T. Kock., ed., *Comicorum Graecorum Fragmenta* (Leipzig, 1880–1888).

Maso = S. Maso, C. Natali, and G. Seel, eds., *Reading Aristotle's Physics VII.3: What Is Alteration?* (Las Vegas, 2012).

P = P. Pellegrin, *Aristote: Physique* (Paris, 2002).

PNC = Principle of non-contradiction.

R^3 = V. Rose, *Aristotelis Fragmenta*, 3rd ed. (Leipzig, 1886).

Ross = D. Ross, *Aristotle's Physics: A Revised Text with Introduction and Commentary* (Oxford, 1936).

Schiefsky = M. J. Schiefsky, *Hippocrates on Ancient Medicine: Translated with an Introduction and Commentary* (Leiden, 2005).

Simp. = Diels, H., ed., *Simplicius in Aristotelis Physica Commentaria* (Berlin, 1882–1895).

Tarán = L. Tarán, *Speusippus of Athens* (Leiden, 1981).

TEGP = D. W. Graham, *The Texts of Early Greek Philosophy: The Complete Fragments and Selected Testimonies of the Major Presocratics* (Cambridge, 2010).

Theophr. *Met.* = D. Ross and F. Fobes, *Theophrastus Metaphysics* (Oxford, 1929; repr. Hildesheim, 1967).

Wicksteed & Cornford = P. Wicksteed and F. Cornford, *Aristotle: The Physics I* (Cambridge, Mass., 1957), *The Physics II* (Cambridge, Mass., 1934).

A = B = A is identical to (equivalent to) B.

A ≈ B = A is roughly the same as or roughly equivalent or analogous to B.

A ⊃ B = If A then B, or A implies B.

Introduction

Life and Works

Aristotle was born in 384 BC to a well-off family living in the small town of Stagira in northern Greece. His father, Nicomachus, who died while Aristotle was still quite young, was allegedly doctor to King Amyntas of Macedon. His mother, Phaestis, was wealthy in her own right. When Aristotle was seventeen his guardian, Proxenus, sent him to study at Plato's Academy in Athens. He remained there for twenty years, initially as a student, eventually as a researcher and teacher.

When Plato died in 347, leaving the Academy in the hands of his nephew Speusippus, Aristotle left Athens for Assos in Asia Minor, where the ruler, Hermias, was a patron of philosophy. He married Hermias' niece Pythias, and had a daughter by her, also named Pythias. Three years later, in 345, after Hermias had been killed by the Persians, Aristotle moved to Mytilene on the island of Lesbos, where he met Theophrastus, who was to become his best student and closest colleague.

In 343 Aristotle seems to have been invited by Philip of Macedon to be tutor to the latter's thirteen-year-old son, Alexander, later called "the Great." In 335 Aristotle returned to Athens and founded his own institute, the Lyceum. While he was there his wife died and he established a relationship with Herpyllis, also a native of Stagira. Their son Nicomachus was named for Aristotle's father, and the *Nicomachean Ethics* may, in turn, have been named for him or transcribed by him. In 323 Alexander the Great died, with the result that anti-Macedonian feeling in Athens grew stronger. Perhaps threatened with a formal charge of impiety (*NE* X 7 1177^{b}33), Aristotle left for Chalcis in Euboea, where he died twelve months later, in 322, at the age of sixty-two.

Legend has it that Aristotle had slender calves, small eyes, spoke with a lisp, and was "conspicuous by his attire, his rings, and the cut of his hair." His will reveals that he had a sizable estate, a domestic partner, two children, a considerable library, and a large circle of friends. In it Aristotle asks his executors to take special care of Herpyllis. He directs that his slaves be freed "when they come of age" and that the bones of his wife, Pythias, be mixed with his "as she instructed."

Although the surviving writings of Aristotle occupy almost 2,500 tightly printed pages in English, most of them are not works polished for publication but sometimes incomplete lecture notes and working papers. This accounts for some, though not all, of their legendary difficulty. It is unfair to complain, as a Platonist opponent did, that Aristotle "escapes refutation by clothing a perplexing subject in obscure language, using darkness like a squid to make himself hard to catch," but there is darkness and obscurity enough for anyone, even if none of it is intentional. There is also a staggering breadth and depth of intellect. Aristotle made fundamental contributions to a vast range of disciplines, including logic, metaphysics, epistemology, psychology, ethics, politics, rhetoric, aesthetics, zoology, biology, physics, and philosophical and political history. When Dante called him "the master of those who know," he was scarcely exaggerating.

What the Physics *Is*

One thing we might mean by the *Physics* is what we now find in the pages that make up W. D. Ross's Oxford Classical Text (OCT) edition of the Greek text, first published in 1950, which is the basis of the present translation. This is the descendant of texts derived—via manuscripts copied in the Byzantine period (from the tenth to the fifteenth centuries AD)—from manuscripts that derive in turn from the edition of Aristotle's works produced by Andronicus of Rhodes in the first century BC. Thus Ross's edition, like most other modern editions, records in the textual apparatus at the bottom of the page various manuscript readings alternative to the one he prints in the body of his text. In some cases, I have preferred one of these readings, or some other reading suggested by an editor, indicating my preference in the associated notes. Also present in Ross's text, as in all worthwhile modern editions, are book and chapter divisions provided by editors as well as the page numbers of Immanuel Bekker, *Aristotelis Opera*. Here these appear in the margins of the print edition, and between upright lines in the translation itself in the electronic one (for example, |211^{a}10|), at the end of the first line in a column to which they apply. Occasional material in square brackets is my clarificatory addition.*

The second thing we might mean by the *Physics* is the work itself, so to speak, the more abstract entity that is embodied in a good edition of the Greek text and (ideally) in any translation of it. And it is clear from the beginning that its focus at any rate is on the world of nature (*phusis*), a world pretty much coincident with the sublunary realm, consisting canonically of matter-form compounds, whose material component involves the sublunary elements—earth, water, air, and fire. Were these the only substances, the only primary beings, we learn in the *Metaphysics*, the science of them would be the science that the *Metaphysics* itself wishes to investigate, and which is referred to as theoretical wisdom, the science of being qua being, and the primary science or primary philosophy.

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*Some issues concerning the unity of the text are discussed in the headnote to Book VII.

> That natural science is a theoretical science, then, is evident from these considerations. Mathematics too is a theoretical one, but whether its objects are immovable and separable is not now clear; however, it is clear that *some* parts of mathematics get a theoretical grasp on their objects insofar as they are immovable and insofar as they are separable. But if there is something that is eternal and immovable and separable, it is evident that knowledge of it belongs to a theoretical science—not, however, to *natural* science (for natural science is concerned with certain moveable things) nor to mathematics, but to something prior to both. For natural science is concerned with things that are inseparable but not immovable, while certain parts of mathematics are concerned with things that are immovable and not separable but as in matter. The primary science, by contrast, is concerned with things that are both separable and immovable. Now all causes are necessarily eternal, and these most of all. For they are the causes of the divine beings that are perceptible. There must, then, be three theoretical philosophies, mathematical, natural, and theological, since it is quite clear that if the divine belongs anywhere, it belongs in a nature of this sort. And of these, the most estimable must be concerned with the most estimable genus. Thus, the theoretical are the more choiceworthy of the various sciences, and this of the theoretical. . . . If, then, there is no other substance beyond those composed by nature, natural science will be the primary science. But if there is some immovable substance, this [that is, theological philosophy] will be prior and will be primary philosophy. (*Met.* VI 1 1026^{a}6–30)

That there is a substance that is at any rate eternal and immovable is argued in *Physics* VIII, and that the gods, including in particular *the* god, are among them is presupposed from quite early on in the *Metaphysics*. Thus in *Met.* I 2 we hear that theoretical wisdom is the science of this god, both in having him as its subject matter and in being the science that is in some sense his science. When it is argued in XII 9 that he must be "the active understanding [that] is active understanding of active understanding" (1074^b34–35), we see how much *his* it is, since actively understanding itself—contemplating itself in an exercise of theoretical wisdom—is just what Aristotle's god *is*.

With just this much on the table there is already a puzzle whose difficulty is increased by special doctrine. Aristotle usually divides the bodies of knowledge he refers to as *epistêmai* ("sciences") into three types: theoretical, practical, and productive (crafts). When he is being especially careful, he also distinguishes within the theoretical sciences between the *strictly theoretical* ones (astronomy, theology), as we may call them, and the *natural* ones, which are like the strictly theoretical ones in being neither practical nor productive but unlike them in consisting of propositions that—though necessary and universal in some sense—hold for the most part rather than without exception:

> If all thought is either practical or productive or theoretical, natural science would have to be some sort of theoretical science—but a theoretical science that is concerned with such being as is capable of being moved and with the substance that in accord with its account holds for the most part only, because it is not separable. (*Met.* VI 1 1025^b25–28; compare *Ph.* II 9 200^a30–$^b9$)

Psychology, as a result, has an interestingly mixed status, part strictly theoretical (because it deals with understanding, which is something divine), part natural (because it deals with perception and memory and other capacities that require a body):

> It is clear that the affections of the soul are enmattered accounts. So their definitions will be of this sort, for example: "Being angry is a sort of movement of such-and-such a sort of body, or of a part or a capacity, as a result of something for the sake of something." And this is why it already belongs to the natural scientist to get a theoretical grasp on the soul, either all soul or this sort of soul. But a natural scientist and a dialectician would define each of these differently—for example, what anger is. For a dialectician it is a desire for retaliation or something like that, whereas for a natural scientist it is a boiling of the blood and hot stuff around the heart. Of these, the scientist gives the matter, whereas the dialectician gives the form and the account. For this is the account of the thing, although it must be in matter of such-and-such a sort if it is to exist. And so of a

> house the account is this, that it is a shelter to prevent destruction by winds, rain, and heat. But one person will say that it is stones, bricks, and timbers, and another that it is the form in them for the sake of these other things. Which of these people, then, is the natural scientist? Is it the one concerned with the matter but ignorant of the account, or the one concerned with the account alone? Or is it rather the one concerned with what is composed of both? Who, then, is each of the others? Or isn't it that there is no one who is concerned with the attributes of the matter that are not separable and insofar as they are not separable? And isn't it, rather, the natural scientist who is concerned with everything that is a function or attribute of this sort of body and this sort of matter? And isn't anything not of this sort the concern of someone else, in some cases a craftsman, if there happens to be one, such as a builder or a doctor? And aren't those things that are not actually separable, but are considered insofar as they are not attributes of this sort of body and in abstraction from it, the concern of the mathematician? And insofar as they are actually separable, that of the primary philosopher? (*DA* I 1 403^{a}25–^{b}16)

When science receives its focused discussion in the *Nicomachean Ethics*, however, Aristotle is explicit that if we are "to speak in an exact way and not be guided by mere similarities" (VI 3 1139^{b}19), we should not call anything a science unless it deals with eternal, entirely exceptionless facts about universals that are wholly necessary and do not at all admit of being otherwise (1139^{b}20–21). Since he is here explicitly epitomizing his more detailed discussion of science in the *Posterior Analytics* (as 1139^{b}27 tells us), we should take the latter too as primarily a discussion of science in the exact sense, which it calls *epistêmê haplôs*—unconditional scientific knowledge. It follows that only the strictly theoretical sciences are sciences in this sense. It is on these that the others should be modeled to the extent that they can be: "it is the things that are always in the same state and never undergo change that we must make our basis when pursuing the truth, and this is the sort of thing that the heavenly bodies are" (*Met.* XI 6 1063^{a}13–15).

Having made the acknowledgment, though, we must also register the fact that Aristotle himself mostly does not speak in the exact way but instead persistently refers to bodies of knowledge other than the strictly theoretical sciences as *epistêmai*. His division of the *epistêmai* into theoretical, practical, and productive is a dramatic case in point. But so too is his use of the term *epistêmê*, which we first encounter in the *Metaphysics*, for example, as a near synonym of *technê* or craft knowledge, which is productive not theoretical (I 1 981^{a}3).

An Aristotelian science, although a state of the soul rather than a set of propositions in a textbook, nonetheless does involve an affirmational grasp of a set of true propositions (*NE* VI 3 1139^{b}14–16). Some of these propositions are indemonstrable starting-points or first principles (*archai*), which are or are expressed in definitions, and others are theorems demonstrable from these starting-points. We can have scientific knowledge only of the theorems, since—exactly speaking—only what is demonstrable can be scientifically known (VI 6). Yet—in what is clearly another lapse from exact speaking—Aristotle characterizes "the most exact of the sciences," which is theoretical wisdom (*sophia*), as also involving a grasp by understanding (*nous*) of the truth where the starting-points themselves are concerned (VI 7 1141^{a}16–18). He does the same thing in the *Metaphysics,* where theoretical wisdom is the *epistêmê* that provides "a theoretical grasp of the primary starting-points and causes"—among which are included "the good or the for sake of which" (I 2 982^{b}7–10). It is for this reason that the god's grasp of himself through understanding is an exercise of scientific knowledge.

Now each of these sciences, regardless of what group it falls into, must—for reasons having to do with the nature of definition and demonstration—be restricted in scope to a single genus of beings (*Ph.* I 1 184^{a}1n). Since being is not itself a genus (*APo.* II 7 92^{b}14), as Aristotle goes out of his way not just to acknowledge but to prove (*Met.* IV 2), it apparently follows that there should be no such science as the science of being qua being—as theoretical wisdom. To show that there is one thus takes some work. By the same token, there should be no such science as natural science, but only a collection of distinct sciences, each focused exclusively on its own distinct genus of natural beings.

It is a cliché of the history of philosophy that Aristotle is an empiricist and Plato a rationalist, and like all clichés there is some truth in it. In fact, Aristotle is not just an empiricist at the level of the sciences we call empirical, he is an empiricist at all levels. To see what I mean, think of each of the special, genus-specific sciences—the *first-order* sciences—as giving us a picture of a piece of the world, a region of being. Then ask, what is the world like that these sciences collectively portray? What is the nature of reality as a whole—of being as a whole? If there is no answer besides the collection of special answers, the world is, as Aristotle puts it, episodic—like a bad tragedy (*Met.* XII 10 1076^{a}1, XIV 3 1090^{b}20). But if there is an answer, it should emerge from a meta-level empirical investigation of the special sciences themselves. As each of these looks for universals (natural kinds) that stand in demonstrative causal relations to each other, so this meta-level investigation looks for higher-level universals that reveal the presence of common structures of explanation in diverse sciences:

> The causes and starting-points of distinct things are distinct in a way, but in a way—if we are to speak universally and analogically—they are the same for all. . . . For example, the elements of perceptible bodies are presumably: as *form*, the hot and, in another way, the cold, which is the *lack*; and, as *matter*, what is potentially these directly and intrinsically. And both these and the things composed of them are substances, of which these are the starting-points (that is, anything that comes to be from the hot and the cold that is one [something-or-other], such as flesh or bone), since what comes to be from these must be distinct from them. These things, then, have the same elements and starting-points (although distinct things have distinct ones). But that all things have the same ones is not something we can say just like that, although *by analogy* they do. That is, we might say that there are three starting-points—the form and the lack and the matter. But each of these is distinct for each category (*genos*)—for example, in colors they are white, black, and surface, or light, darkness, and air, out of which day and night come to be. (*Met.* XII 4 1070^{a}31–^{b}21)

The genus-specific sciences show the presence in the world of a variety of *different* explanatory structures. The trans-generic sciences, by finding commonalities between these structures, show the equally robust presence there of the *same* explanatory structure: form, lack of form, matter.

The science to which form, lack, and matter belong is, in the first instance, trans-generic or universal natural science. It is the one that would be the primary science, as we saw, were there no eternal immovable substances separable from the natural ones. But there is also a trans-generic—or universal—mathematical science:

> We might raise a puzzle indeed as to whether the primary philosophy is universal or concerned with a particular genus and one particular nature. For it is not the same way even in the mathematical sciences, but rather geometry and astronomy are concerned with a particular nature,

> whereas universal mathematics is common to all. (*Met.* VI 1 1026^a23–27)*

The introduction of intelligible matter (*Met.* VII 10 1036^a11–12), as the matter of abstract mathematical objects, allows us to see a commonality in explanatory structure between the mathematical sciences and the natural ones. Between these two trans-generic sciences and the theological one (VI 1 1026^a19), on the other hand, the point of commonality lies not in matter, since the objects of theological science have no matter (XII 6 1071^b20–21), but rather in form. For what the objects of theology, namely, divine substances (which includes human understanding or *nous*), have in common with those of mathematics and natural science is that they are forms,

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*Many theorems in mathematics are special to some branch of it, such as arithmetic or geometry, but there are also "certain mathematical theorems of a universal character" (*Met.* XIII 2 1077^a9–10). Here is an example: "That proportionals alternate might be thought to apply to numbers qua numbers, lines qua lines, solids qua solids, and times qua times, as used to be demonstrated of these separately, although it is possible to show it of all cases by a single demonstration. But because all these things—numbers, lengths, times, solids—do not constitute a single named [kind] and differ in form from one another, they were treated separately. But now it is demonstrated universally: for what is supposed to hold of them universally does not hold of them qua lines or qua numbers but qua this [unnamed kind]" (*APo.* I 5 74^a17–25). Nonetheless, the universality of the demonstration is open to challenge on the grounds that lines and numbers differ in genus. For "it is necessary for the extreme and middle terms in a demonstration to come from the same genus" (I 7 75^b10–11), so that trans-generic demonstrations are ruled out: "it is impossible that what is shown should cross from one genus to another" (I 23 84^b17–18). Hence "the why [that is, why the theorem about proportionals holds in the case of lines and of numbers] is different" (II 17 99^a8–9), and so separate demonstrations seem to be needed in the case of each. Nonetheless, "qua such-and-such an increase in quantity" (99^a9–10) the demonstration is the same, so that the theorem "holds in common of all *quantities*" (*Met.* XI 4 1061^b19–21). For "while the genera of the beings are different, some attributes belong to quantities and others of qualities alone, with the help of which we can show things" (*APo.* II 32 88^b1–3). But though the universal theorem holds of all quantities, it does so *by analogy*: "Of the items used in the demonstrative sciences some are special to each science and others common—but common by analogy, since they are only useful in so far as they bear on the genus falling under the science. Proper—for example that a line is such-and-such, and straight so-and-so. Common—for example, that if equals are taken from equals, the remainders are equal" (*APo.* I 10 76^a37–41). Thus the kind to which lines, numbers, and so on belong, which is the ontological correlate of a theorem of universal mathematics, is not a first-order genus, but an analogical unity—a quantity.

though—and this is the crucial point of difference—not forms in any sort of matter whatsoever. That form should be a focal topic of investigation for the science of being qua being is thus the result of an inductive or empirical investigation of the various genus-specific sciences, and then of the various trans-generic ones, which shows form to be the explanatory feature common to all their objects—to all beings.

It is this empirical fact that provides the science of being qua being with a genuine trans-generic object of study, thereby legitimating it as every bit as much a science as any generic-specific one. The science of being qua being is accordingly a science of form. The question now is how can that science at the same time be theology, the science of divine substance? And to it Aristotle gives a succinct answer:

> If there is some immovable substance, this [that is, theological philosophy] will be prior and will be primary philosophy, and it will be universal in this way, namely, because it is primary. And it will belong to it to get a theoretical grasp on being qua being, both what it is and the things that belong to it qua being. (*Met.* VI 1 1026^{a}23–32)

So the primacy of theology, which is based on the fact that theology deals with substance that is eternal, immovable, and separable, is supposedly what justifies us in treating it as the universal science of being qua being.

To get a handle on what this primacy is, we need to turn to being and its structure. The first thing to grasp is that beings are divided into categories: substance, quality, quantity, relation, and so on (*Ph.* I 1 184^{a}1n (7)). But of these, only beings in the category of substance are separable, so that they alone enjoy a sort of ontological priority that is both existential and explanatory (I 2 185^{a}31n). Other beings are attributes or affections of different sorts, which exist only by belonging to some substance. So if we want to explain what a quality is, for example, we have to say what sort of attribute it is and ultimately what in a substance is receptive of it. It is this fact that gives one sort of unity to beings: they are all either substances or attributes of substances. Hence the famous claim:

> Indeed, the question that was asked long ago, is now, and always will be asked, and is always raising puzzles—namely, What is being?—is just the question, What is substance? . . . And that is why we too must most of all, primarily, and (one might almost say) exclusively get a theoretical grasp on what it is that is a being in this [substantial] way. (*Met.* VII 1 1028^{b}2–7)

The starting-points and causes of beings qua beings, then, must be substances. Thus while something is said to be in as many ways as there are categories, they are all so said "with reference to one thing and one nature" (*Met.* IV 2 1003^a33–34)—substance. It could still be the case, of course, that the cosmos is episodic like a bad tragedy, made up of lots of separate substances having little ontologically to do with each other, but the number of episodes has at least been systematically reduced.

Before turning to the next phase in being's unification, we need to look more closely at substance itself as it gets investigated and analyzed in *Met.* VII–IX. The analysis begins with a *legomenon*—with something said and accepted quite widely.

> Something is said to be (*legetai*) substance, if not in more ways, at any rate most of all in four. For the essence, the universal, and the genus seem to be the substance of each thing, and fourth of these, the underlying subject. (*Met.* VII 3 1028^b33–36)

Since "the primary underlying subject seems most of all to be substance" (*Met.* VII 3 1029^a1–2), because what is said or predicated of it depends on it, the investigation begins with this subject, quickly isolating three candidates: the matter, the compound of matter and form, and the form itself (1029^a2–3), which is identical to the essence (7 1032^b1–2). Almost as quickly (3 1029^a7–32), the first two candidates are at least provisionally excluded, leaving form alone as the most promising candidate for being substance. But form is "most puzzling" (1029^a33) and requires extraordinary ingenuity and resources to explore.

Aristotle begins the investigation into it with the most familiar and widely recognized case, which is the form or essence present in sublunary matter-form compounds. This investigation is announced in *Met.* VII 3 1029^b3–12, but not begun till some chapters later and not really completed till the end of IX 5. By then the various other candidates for being substance have been eliminated or reconceived, and actuality and potentiality have come to prominence. Hence in IX 6 it is with actuality or activity—*entelecheia* or *energeia* (*Ph.* I 2 186^a3)—that form, and so substance, is identified, and matter with potentiality.

Precisely because actuality and potentiality are the ultimate explanatory factors, however, they themselves cannot be given an explanatory definition in yet more basic terms. Instead we must grasp them by means of an analogy:

> What we wish to say is clear from the particular cases by induction, and we must not look for a definition of everything, but

> be able to comprehend the analogy, namely, that as what is building is in relation to what is capable of building, and what is awake is in relation to what is asleep, and what is seeing is in relation to what has its eyes closed but has sight, and what has been shaped out of the matter is in relation to the matter, and what has been finished off is to the unfinished. Of the difference exemplified in this analogy let the activity be marked off by the first part, the potentiality by the second. (*Met.* IX 6 1048^{a}35–^{b}6)

What is common to matter-form compounds, mathematical objects, and divine substances, then, is actuality. In the case of matter-form compounds and numbers, the actuality is accompanied by potentiality—perceptual sublunary matter in the first case, intelligible matter in the second. In the case of divine substances and other such unmoved movers, it is not. They are "pure" activities or actualities, wholly actual at each moment. Matter-form compounds, by contrast, are never wholly actual—they are always in some way potential. You are actively reading this now, not actively swimming, but you could be swimming, since you have the presently un-activated capacity (or potential) to swim.

The science of being qua being can legitimately focus on form, or actuality, as the factor common to divine substances, matter-form compounds, and mathematical objects. But unless it can be shown that there is some explanatory connection between the forms in these different beings the non-episodic nature of being itself will still not have been established, and the pictures given to us by the natural, mathematical, and theological sciences will, so to speak, be separate pictures, and the being they collectively portray will be divided.

The next stage in the unification of being, and the legitimation of the science dealing with it qua being, is effected by an argument that trades, unsurprisingly, on the identification of form and matter with actuality and potentiality. Part of the argument is given in *Met.* IX 8–9, where the various sorts of priority requisite in a substance are argued to belong to actuality rather than potentiality. But it is in XII 6 that the pertinent consequences are most decisively drawn:

> If there is something that is capable of moving things or acting on them, but that is not actively doing so, there will not [necessarily] be movement, since it is possible for what has a capacity not to activate it. There is no benefit, therefore, in positing eternal substances, as those who accept the Forms do, unless there is to be present in them some starting-point that is capable of causing change. Moreover, even this is not enough, and

> neither is another substance beyond the Forms. For if it will not be active, there will not be movement. Further, even if it will be active, it is not enough, if the substance of it is a capacity. For then there will not be *eternal* movement, since what is potentially may possibly not be. There must, therefore, be such a starting-point, the very substance of which is activity. Further, accordingly, these substances must be without matter. For they must be eternal, if indeed *anything* else is eternal. Therefore they must be activity. (*Met.* XII 6 1071^{b}12–22)

Matter-form compounds are, as such, capable of movement and change. The canonical examples of them—perhaps the only genuine or fully fledged ones—are living metabolizing beings (*Met.* VII 17 1041^{b}29–30). But if these beings are to be actual, there must be substances whose very essence is activity—substances that do not need to be activated by something else.

With matter-form compounds shown to be dependent on substantial activities for their actual being, a further element of vertical unification is introduced into beings, since layer-wise the two sorts of substances belong together. Laterally, though, disunity continues to threaten. For as yet nothing has been done to exclude the possibility that each compound substance has a distinct substantial activity as its own unique activator. Being, in that case, would be a set of ordered pairs, the first member of which was a substantial activity, the second a matter-form compound, with all its dependent attributes.

In *Met.* XII 8 Aristotle initially takes a step in the direction of such a bipartite picture. He asks how many substantial activities are required to explain astronomical phenomena, such as the movements of the stars and planets, and answers that there must be forty-nine of them (1074^{a}16). But these forty-nine are visibly coordinated with each other so as to form a system. And what enables them to do so, and constitute a single heaven, is that there is a single prime mover of all of them:

> It is evident that there is but one heaven. For if there are many, as there are many humans, the starting-point for each will be one in form but in number many. But all things that are many in number have matter, for one and the same account applies to many, for example, humans, whereas Socrates is one. But the primary essence does not have matter, since it is an actuality. The primary immovable mover, therefore, is one both in account and in number. And so, therefore, is what is moved always and continuously. Therefore, there is only one heaven. (*Met.* II 8 1074^{a}31–38)

The argument is puzzling, to be sure, since the immateriality that ensures the uniqueness of the prime mover would seem to threaten the multiplicity of the forty-nine movers, since they are also immaterial, nonetheless the point of it is clear enough: what accounts for the unity of the heaven is that the movements in it are traceable back to a single cause—the prime or primary mover.

Leaving aside the question of just how this primary mover moves what it moves directly, which is left unanswered in the *Physics* but discussed in *Met.* XII 7, the next phase in the unification of beings is the one in which the sublunary world is integrated with the already unified superlunary one studied by astronomy. This takes place in *Met.* XII 10, although elements of it have emerged earlier. One obvious indication of this unification is the dependence of the reproductive cycles of plants and animals on the seasons, and their dependence, in turn, on the movements of the sun and moon:

> The cause of a human is both his elements, fire and earth as matter and the special form [as form], and furthermore some other external thing, such as the father, and beyond these the sun and its movement in an inclined circle. (*Met.* XII 10 1071^{a}13–16)

And beyond even that there is the unity of the natural world itself, which is manifested in the ways in which its inhabitants are adapted to each other:

> All things are jointly organized in a way, although not in the same way—even swimming creatures, flying creatures, and plants. And the organization is not such that one thing has no relation to another but rather there is a relation. For all things are jointly organized in relation to one thing—but it is as in a household, where the free men least of all do things at random, but all or most of the things they do are organized, while the slaves and beasts can do a little for the common thing, but mostly do things at random. For this is the sort of starting-point that the nature is of each of them. I mean, for example, that all must at least come to be disaggregated [into their elements]; and similarly there are other things which they all share for the whole. (*Met.* XII 10 1075^{a}16–25)

Just how much unity all this results in—just what it means to speak of "the nature of the whole" (*Met.* XII 10 1075^{a}11) or of the universe as having "one ruler" (1076^{a}4)—is a matter of dispute. The fact remains, though, that the sublunary realm is sufficiently integrated with the superlunary one that we can speak of them as jointly having a nature and a ruler, and as being analogous not to Heraclitus' "heap of random sweepings," but to an army (1075^a13) and a household (1075^a22).

We may agree, then, that the divine substances in the superlunary realm and the compound substances in the sublunary one have prima facie been vertically integrated into a single explanatory system. When we look at the form of a sublunary matter-form compound, then, we will find in it the mark of a superlunary activator, just as we do in the case of the various heavenly bodies, and, as in the line of its efficient causes, we find "the sun and its movement in an inclined circle" (*Met.* XII 7 1071^a15–16). Still awaiting integration, though, are the mathematical objects, and their next of kin, Platonic forms.

That there is mathematical structure present in the universe can seem to be especially clear in the case of the superlunary realm, just as mathematics itself, with its rigorous proofs and necessary and certain truths, can seem the very paradigm of scientific knowledge. So it is hardly surprising that some of Aristotle's predecessors, especially Pythagoreans and Platonists, thought that the primary causes and starting-points of beings are to be found in the part of reality that is mathematics friendly, or in some way mathematizable. For example, some Platonists (Plato among them, in Aristotle's much disputed view) held that for each kind of sublunary (or perceptible) thing there was an eternal intelligible Form or Idea to which it owed its being, and which owed its own being, in turn, to "the one," as its substance, and the so-called indefinite dyad of the great and the small, as its matter. So when we ask what makes a man a man, the answer will be, because it participates in the Form or Idea of a man, which owes its being to the way it is constructed or generated from the indefinite dyad and the one (*Ph.* IV 2 209^b7–16, 209^b33–210^a2). And because the Forms are so constructed, Aristotle says (anyway on one reading of the text) that "the Forms are the numbers" (*Met.* I 6 987^b20–22). Between these so-called Form (or Ideal) numbers, in addition, are the numbers that are the objects of mathematics: the intermediates. This elaborate system of, as I put it, mathematics-friendly objects, then, are the substances—the ultimate starting-point and causes of beings qua beings.

Against these objects and the ontological role assigned to them, Aristotle launches a host of arguments (thirty-two or so in *Met.* I 9, twenty-four in XIII 8–9, and many others elsewhere), proposing in their place an entirely different account of mathematical objects, which treats them not as substantial starting-points and causes but as abstractions from perceptible sublunary beings—dependent entities, in other words, rather that self-subsistent or intrinsic ones (*Ph.* II 2 193^b31–35). This completes the vertical and horizontal unification of being: attributes depend on substances, substantial matter-form compounds depend on substantial forms, or activities, numbers depend on matter-form compounds.

Beings are not said to be "in accord with one thing," then, as they would be if they formed a single genus, but "with reference to one thing"—namely, a divine substance that is in essence an activity. And it is this more complex unity, compatible with generic diversity, and a genuine multiplicity of distinct genus-specific sciences, but just as robust and well grounded as the simpler genus-based sort of unity, that grounds and legitimates the science of being qua being as a single science dealing with a genuine object of study (*Met.* IV 2 1003^b11–16). The long argument that leads to this conclusion is thus a sort of existence proof of the science on which the *Metaphysics* focuses.

It is the priority of a divine substance with that science that justifies each of the following descriptions of what the *Metaphysics* is about:

> If, then, there is no other substance beyond those composed by nature, natural science will be the primary science. But if there is some immovable substance, this [that is, theological philosophy] will be prior and will be primary philosophy, and it will be universal in this way, namely, because it is primary. And it will belong to it to get a theoretical grasp on being qua being, both what it is and the things that belong to it qua being. (*Met.* VI 1 1026^a27–32)

> Whether there is, beyond the matter of these sorts of substances, another sort of matter, and whether to look for another sort of substance, such as numbers or something of this sort, must be investigated later. For it is for the sake of this that we are trying to make some determinations about the perceptible substances, since in a certain way it is the function of natural science and second philosophy to have a theory about the perceptible substances. (*Met.* VII 11 1037^a10–16)

> Since we have spoken about the capacity [or potentiality] that is said [of things] with reference to movement, let us make some distinctions concerning activity, both concerning what it is and what sort of thing. For the capable too will at the same time become clear as we make our determinations, because we do not say only of that which naturally moves something else, or is moved by something else, that it is capable, whether unconditionally or in a certain way, but also use the term in a different

> way, which is why in the course of our inquiry we went through the former. (*Met.* IX 6 1048^{a}25–30)
>
> Concerning the primary starting-points and the primary causes and elements, however, some of what is said by those who speak only about perceptible substance has been discussed in our works on nature, while some does not belong to the present method of inquiry. But what is said by those who assert that there are other substances beyond the perceptible ones is something we need to get a theoretical grasp on next after what we have just discussed. (*Met.* XIII 9 1086^{a}21–26)

The science of being qua being is a sort of theology, as *Met.* II 2 already told us it was, but it is a sort of theology only because of the special role of the primary god among beings.

Is the Investigation in the Physics *a Scientific One?*

If we think of a science in the exact sense as consisting exclusively of what is demonstrable, as we saw Aristotle himself sometimes does, we will be right to conclude that a treatise without demonstrations cannot be scientific. But if, as he also does, we include knowledge of starting-points as parts of science, we will not be right, since a treatise could contribute to a science not by demonstrating anything but by arguing to the starting-points themselves—an enterprise which could not without circularity consist of demonstrations *from* those starting-points. Arguments leading *from* starting-points and arguments leading *to* starting-points are different, we are invited not to forget (*NE* I 4 1095^{a}30–32), just as we are told that because establishing starting-points is "more than half the whole" (I 7 1098^{b}7), we should "make very serious efforts to define them correctly" (1098^{b}5–6). We might reasonably infer, therefore, that the *Physics* is a contribution to universal natural science precisely because it contributes to the correct definition and secure grasp of the starting-points without which no genus-specific natural science can exist.

In our investigation of starting-points, "we must," Aristotle says, "start from things known *to us*" (*NE* I 4 1095^{b}3–4). For the sake of clarity, let us call these *raw starting-points*. These are the ones we start from when we are arguing to *explanatory scientific starting-points*. It is important not to confuse the two. In the case of the special sciences the *explanatory starting-points* include, in particular, definitions that specify the genus and differentiae of the real (as opposed to nominal) universal essences of the beings with which the science deals (*APo.* II 10 93^{b}29–94^{a}19). Since scientific definitions must be apt starting-points of demonstrations, this implies, Aristotle thinks, that the "extremes and the middle terms must come from the same genus" (I 7 75^{b}10–11). As a result a single canonical science must deal with a single genus (I 28 87^{a}38–39). To reach these definitions from *raw starting-points*, we first have to have the raw starting-points at hand. Aristotle is clear about this, as he is indeed about what is supposed to happen next:

> The method (*hodos*) is the same in all cases, in philosophy as well as in the crafts or any sort of learning whatsoever. For one must observe for both terms what belongs to them and what they belong to, and be supplied with as many of these terms as possible, and one must investigate them by means of the three terms [in a syllogism], in one way when refuting, in another way when establishing something. When it is in accord with truth, it must be from the terms that are catalogued (*diagegramenôn*) as truly belonging, but in dialectical deductions it must be from premises that are in accord with [reputable] belief. . . . Most of the starting-points, however, are special to each science. That is why experience must provide us with the starting-points where each is concerned—I mean, for example, that experience in astronomy must do so in the case of astronomical science. For when the things that appear to be so had been adequately grasped, the demonstrations in astronomy were found in the way we described. And it is the same way where any other craft or science whatsoever is concerned. Hence if what belongs to each thing has been grasped, at that point we can readily exhibit the demonstrations. For if nothing that truly belongs to the relevant things has been omitted from the collection, then concerning everything, if a demonstration of it exists we will be able to find it and give the demonstration, and if it is by nature indemonstrable, we will be able to make that evident. (*APr.* I 30 46^{a}3–27)

Once we have a catalogue of the *raw starting-points*, then, the demonstrative explanation of them from explanatory scientific starting-points is supposedly fairly routine. We should not, however, demand "the cause [or explanation] in all cases alike. Rather, in some it will be adequate if the fact that they are so has been correctly shown (*deiknunai*) as it is indeed where starting-points are concerned" (*NE* I 8 1098^{a}33–^{b}2). But what exactly is it to show a starting-point correctly or adequately?

Aristotle describes natural science as a branch of theoretical philosophy (*Met.* VI 1 1026^{a}18–19) or theoretical science (XI 7 1064^{b}1–3), and to the explanatory scientific starting-points of philosophical sciences, he claims, there is a unique route:

> Dialectic is useful in the philosophical sciences because the capacity to go through the puzzles on both sides of a question will make it easier to discern what is true and what is false in each. Furthermore, dialectic is useful in relation to the primary [starting-points] (*ta prota*) in each science. For it is impossible to say anything about these based on the starting-points properly belonging to the science in question, since these starting-points are, of all of them, the primary ones, and it is through reputable beliefs (*endoxa*) about each that it is necessary to discuss them. This, though, is a task special to, or most characteristic of, dialectic. For because of its ability to stand outside and examine (*exetastikê*), it has a route toward the starting-points of all methods of inquiry. (*Top.* I 2 101^{a}34–^{b}4)

And this is repeated almost word for word in the *Physics* itself with reference to the concept of place, which is a natural scientific starting-point:

> We must try to make our investigation in such a way that the what-it-is is given an account of, so that the puzzles are resolved, the things that are believed to belong to place will in fact belong to it, and furthermore, so that the cause of the difficulty and of the puzzles concerning it will be evident, since this is the best way of showing each thing. (*Ph.* IV 4 211^{a}7–11)

We might notice in this regard that the verb *deiknunai* occurs around fifty times in the *Physics* and the word *aporia* around sixty. Prima facie, then, the *Physics* should correctly show the explanatory starting-points of *universal natural science* by going through puzzles and solving these by appeal to reputable beliefs. But before we rush to the *Physics* to see whether that is what we do find, we need to be clearer about what exactly we should be looking for.

Dialectic is recognizably a descendant of the Socratic elenchus, which famously begins with a question like this: *Ti esti to kalon?* What is the noble? The respondent, sometimes after a bit of nudging, comes up with a universal definition, what is noble is what all the gods love, or whatever it might be (I adapt a well-known answer from Plato's *Euthyphro*). Socrates then puts this definition to the test by drawing attention to some things that seem true to the respondent himself but which conflict with his definition. The puzzle or *aporia* that results from this conflict then remains for the respondent to try to solve, usually by reformulating or rejecting his definition. Aristotle understood this process in terms that show its relationship to his own:

> Socrates, on the other hand, busied himself about the virtues of character, and in connection with them was the first to inquire about universal definition. . . . It was reasonable, though, that Socrates was inquiring about the what-it-is. For he was inquiring in order to deduce, and the what-it-is is a starting-point of deductions. For at that time there was not yet the strength in dialectic that enables people, and separately from the what-it-is, to investigate contraries, and whether the same science is a science of contraries. For there are two things that may be fairly ascribed to Socrates—inductive arguments and universal definition, both of which are concerned with a starting-point of scientific knowledge. (*Met.* XIII 4 1078^{b}17–30; also I 6 987^{b}1–4)

In Plato too dialectic is primarily concerned with scientific starting-points, such as those of mathematics, and seems to consist in some sort of elenchus-like process of reformulating definitions in the face of conflicting evidence so as to render them puzzle free (*Rep.* VII 532a1–533d1). Aristotle can reasonably be seen, then, as continuing a line of thought about dialectic, while contributing greatly to its exploration, systemization, and elaboration in works such as *Topics* and *Sophistical Refutations*.

Consider now the respondent's first answer, his first definition: what is noble is what the gods love. Although it is soon shown to be incorrect, there is something quite remarkable about its very existence. Through experience shaped by acculturation and habituation involving the learning of a natural language the respondent is confident that he can say what nobility is. He has learned to apply the word "noble" to particular people, actions, and so on correctly enough to pass muster as knowing its meaning, knowing how to use it. From these particular cases he has reached a putative universal, something the particular cases have in common. But when he tries to define that universal in words, he gets it wrong, as Socrates shows. Here is Aristotle registering the significance of this: "The things that are knowable and primary for particular groups of people are often only slightly knowable and have little or nothing of the being in them. Nonetheless, beginning from things that are poorly known but known to ourselves, we must try to know the ones that are wholly knowable, proceeding, as has just been said, through the former" (*Met.* VII 3 1029^{b}8–12).

The route by which the respondent reaches the universal that he is unable to define correctly is what Aristotle calls induction (*epagôgê*). This begins with (1) perception of particulars, which leads to (2) retention of perceptual contents in memory, and, when many such contents have been retained, to (3) an experience, so that for the first time "there is a universal in the soul" (*APo.* II 19 100^a3–16). The universal reached at stage (3), which is the one the respondent reaches, is described as "rather confused" and "more knowable by perception" (*Ph.* I 1 184^a22–25). It is the sort of universal, often quite complex, that constitutes a nominal essence corresponding to the nominal definition or meaning of a general term. Finally, (4) from experience come craft knowledge and scientific knowledge, when "from many intelligible objects arising from experience one universal supposition about similar objects is produced" (*Met.* I 1 981^a5–7).*

The *nominal* (or analytic, meaning-based) definition of the general term "thunder," for example, might pick out the universal *loud noise in the clouds*. When science investigates the things that have this nominal essence, it may find that they also have a real essence or nature in terms of which their other features can be scientifically explained:

> Since a definition is said to be an account of what something is, it is evident that one sort will be an account of what its name, or some other name-like account, signifies—for example, what triangle signifies. . . . Another sort of definition is an account that makes clear why it exists. So the former sort signifies something but does not show it, whereas the latter will evidently be like a demonstration of what it is, differing in arrangement from a demonstration. For there is a difference between saying why it thunders and saying what thunder is. In the first case you will say: because fire is being extinguished in the clouds. And what is thunder? The loud noise of fire being extinguished in the clouds. Hence the same account is given in different ways. In one way it is a continuous demonstration, in the other

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*Compare: "Unconditionally, what is prior is more knowable than what is posterior—for example, a point than a line, a line than a plane, and a plane than a solid, just as a unit is more so than a number, since it is prior to and a starting-point of all number. Similarly, a letter is more so than a syllable. To us, on the other hand, it sometimes happens that the reverse is the case. For the solid falls most under perception, the plane more than the line, line more than point. For ordinary people know things of the former sort earlier. For to learn them is a task for random thought, whereas to learn the others is a task for exact and extraordinary thought" (*Top.* VI 4 141^b5–14).

> a definition. Further, a definition of thunder is a noise in the clouds, and this is a conclusion of the demonstration of what it is. The definition of an immediate item, though, is an indemonstrable positing (*thesis*) of what it is. (*APo.* II 10 93^b29–94^a10; compare *DA* II 2 413^a13–20)

A real (or synthetic, fact-based) definition, which analyzes this real essence into its "elements and starting-points" (*Ph.* I 1 184^a23), which will be definable but indemonstrable within the science, makes intrinsically clear what the nominal definition made clear only by enabling us to recognize instances of thunder in a fairly—but imperfectly—reliable way. As a result, thunder itself, now clearly a natural and not just a conventional kind, becomes better known not just to us but entirely or unconditionally. These analyzed universals, which are the sort reached at stage (4), are the ones suited to serve as starting-points of the sciences and crafts: "experienced people know the that but do not know the why, whereas craftsmen know the why, that is, the cause" (*Met.* I 1 981^a28–30).

Socrates too, we see, wanted definitions that were not just empirically adequate but also explanatory: in telling Euthyphro what he wants in the case of piety, he says that he is seeking "the form itself *in virtue of which* all the pieties are pieties" (*Euthphr.* 6d10–11). That is why he rejects the definition of piety as being what all the gods love. This definition is in one way correct, presumably, in that if something is pious it must be loved by the gods and vice versa, but it is not explanatory, since it does not tell us what it is about pious things that makes all the gods love them, and so does not identify the form in virtue of which they are pious (9e–11b).

Let us go back. We wanted to know what was involved in showing a scientific starting-point. We were told how we could *not* do this, namely, by demonstrating it from scientific starting-points. Next we learned that dialectic had a route to it from reputable beliefs. At the same time, we were told that induction had a route to it as well—something the *Nicomachean Ethics* also tells us: "we get a theoretical grasp of some starting-points through induction, some through perception, some through some sort of habituation, and others through other means" (I 7 1098^b3–4). This suggests that induction and dialectic are in some way or other related processes.

What shows a Socratic respondent to be wrong is an example that his definition does not fit. The presentation of the example might be quite indirect, however. It might take quite a bit of stage setting, elicited by the asking of many questions, to bring out a puzzle. But if it does succeed in doing so, it shows that the universal grasped by the respondent and the definition of it produced by him are not entirely or unconditionally knowable and that his state is not one of clear-eyed understanding:

> A puzzle in thought makes manifest a knot in the subject matter. For insofar as thought is puzzled it is like people who are tied up, since in both cases it is impossible to move forward. That is why we must get a theoretical grasp on all the difficulties beforehand, both for these reasons and because those who inquire without first going through the puzzles are like people who do not know where they have to go. And, in addition, a person [who has not already grasped the puzzles] does not even know whether he has found what he is inquiring into. For to someone like that the end is not clear, whereas to a person who has already grasped the puzzles it is clear. (*Met.* II 1 995^{a}30–^{b}2)

But lack of such clear-eyed understanding of a scientific starting-point has serious downstream consequences:

> If we are to have scientific knowledge through demonstration, . . . we must know the starting-points better and be better persuaded of them than of what is being shown, but we must also not find anything more persuasive or better known among things opposed to the starting-points from which a contrary mistaken conclusion may be deduced, since someone who has unconditional scientific knowledge must be incapable of being persuaded out of it. (*APo.* I 2 72^{a}37–^{b}4)

If dialectical examination brings to light a puzzle in a respondent's thought about a scientific starting-point, then, he cannot have any unconditional scientific knowledge even of what he may well be able to demonstrate correctly from it. Contrariwise, if dialectical examination brings to light no such puzzle, he apparently does have clear-eyed understanding, and his route to what he can demonstrate is free of obstacles.

At the heart of dialectic, as Aristotle understands it, is the dialectical deduction (*dialektikos sullogismos*). This is the argument lying behind the questioner's questions, partly dictating their order and content and partly determining the strategy of his examination. In the following passage it is defined and contrasted with two relevant others:

> Dialectical arguments are those that deduce from reputable beliefs in a way that reaches a contradiction; peirastic arguments are those that deduce from those beliefs of the respondent that anyone must know (*eidenai*) who pretends to possess scientific knowledge . . . ; contentious (*eristikos*)

> arguments are those that deduce or appear to deduce from what appear to be reputable beliefs but are not really such. (*SE* 2 165^{b}3–8)

If we think of dialectical deductions in this way, a dialectician, in contrast to a contender, is an honest questioner, appealing to genuinely reputable beliefs and employing valid deductions. "Contenders and sophists use the same arguments," Aristotle says, "but not to achieve the same goal. . . . If the goal is apparent victory, the argument is contentious; if it is apparent wisdom, sophistic" (*SE* 11 171^{b}27–29). Nonetheless, he does also use the term *dialektikê* as the name for the craft that honest dialecticians and sophists both use: "In dialectic a sophist is so called in virtue of his deliberate choice, and a dialectician is so called not in virtue of his deliberate choice, but in virtue of the capacity he has" (*Rh.* I 1 1355^{b}20–21). If dialectic is understood in this way, a dialectician who deliberately chooses to employ contentious arguments is a sophist (I 1 1355^{a}24–^{b}7).* We need to be careful, therefore, to distinguish *honest dialectic* from what we may call *plain dialectic*, which—like all crafts—can be used for good or ill (*NE* V 1 1129^{a}13–17).

The canonical occasion for the practice of the Socratic elenchus, obviously, is the examination of someone else. But there is nothing to prevent a person from practicing it on himself: "How could you think," Socrates asks Critias, "that I would refute you for any reason other than the one for which I would refute myself, fearing lest I might inadvertently think I know something when I don't know it?" (*Chrm.* 166c7–d2). Dialectic is no different in this regard:

> But the philosopher, who is investigating by himself, does not care whether, though the things through which his deduction proceeds are true and knowable, the answerer does not concede them, because they are close to what was proposed at the start, and he foresees what is going to result, but rather is presumably eager for his claims to be as knowable and as close to it as possible. For it is from things of this sort that scientific deductions proceed. (*Top.* VIII 1 155^{b}10–16; compare *Ph.* VIII 8 263^{a}15–23)

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*Compare: "There are some things that cannot be put in only one genus—for example, the cheat and the slanderer. For neither the one with the deliberate choice to do it but without the capacity, nor the one with the capacity but not the deliberate choice, is a slanderer or a cheat, but rather the one with both" (*Top.* IV 5 126^{b}8–11).

> An inquiry with another person is carried out by means of words (*logôn*), whereas an inquiry by oneself is carried out no less by means of the things at issue themselves. (*SE* 7 169^{a}38–40)

What we are to imagine, then, is that the philosopher surveys the raw scientific starting-points, constructing detailed catalogues of these. He then tries to formulate definitions of the various universals involved in them that seem to be candidate scientific starting-points, testing these against the raw scientific starting-points by trying to construct demonstrations from them. But these definitions will often be no more than partial: the philosopher is only on his way to complete definitional starting-points, just as the demonstrations will often be no more than proto or nascent demonstrations. The often rudimentary demonstrations that we find in Aristotle's scientific treatises are surely parts of this process of arguing *to* not *from* starting-points. We argue to these in part by seeing whether or to what extent we could demonstrate from them.

So: First, we have the important distinction between dialectic proper, which includes the use of what appear to be deductions from what appear to be reputable beliefs, and honest dialectic, which uses only genuine deductions from genuine reputable beliefs. Second, we have the equally important distinction between the use of dialectic in examining a potentially hostile respondent and its use by the philosopher in a perhaps private pursuit of the truth. Third, we have an important contrast between honest dialectical premises and philosophical ones or scientific ones: honest dialectical premises are reputable beliefs, philosophical and scientific premises must be true and knowable. Fourth, we have two apparently equivalent routes to scientific starting-points, one inductive, which starts from *raw starting-points,* and the other dialectic, which starts from reputable beliefs.

According to the official definition, reputable beliefs are "things that are believed by everyone, by the majority, or by the wise—either by all of them, or by most, or by the most well known and most reputable" (*Top.* I 1 100^{b}21–23). Just as the scientist should have a catalogue of scientific truths at hand from which to select the premises of his demonstrations, so a dialectician ought also to select premises "from arguments that have been written down and produce catalogues (*diagraphas*) of them concerning each kind of subject, putting them under separate headings—for example, 'Concerned with good,' 'Concerned with life'" (*Top.* I 14 105^{b}12–15).

Clearly, then, there will be considerable overlap between the scientist's catalogue of raw starting-points and the honest dialectician's catalogue of reputable beliefs. For, first, things that are believed by reputably wise people are themselves reputable beliefs, and, second, any respondent would accept "the beliefs of those who have investigated the subjects in question—for example, on a question of medicine he will agree with a doctor, and on a question of geometry with a geometer" (*Top.* I 10 104^{a}8–37). The catalogues also differ, however, in that not all reputable beliefs need be true. If a proposition is a reputable belief, if it would be accepted by all or most people, it is everything an honest dialectician could ask for in a premise, since his goal is simply this: to show by honest deductions that a definition offered by any respondent whatsoever conflicts—if it does—with other beliefs the respondent has. That is why having a complete or fairly complete catalogue of reputable beliefs is such an important resource for a dialectician. It is because dialectic deals with things only "in relation to belief," then, and not as philosophy and science do, "in relation to truth" (I 14 105^{b}30–31), that it needs nothing more than reputable *beliefs*.

Nonetheless, the fact that all or most people believe something leads us "to trust it as something in accord with experience" (*Div. Somn.* 1 426^{b}14–16), and—since human beings "are naturally adequate as regards the truth and for the most part happen upon it" (*Rh.* I 1 1355^{a}15–17)—as containing some truth. That is why having catalogued some of the things that people believe happiness to be, Aristotle writes: "Some of these views are held by many and are of long standing, while others are held by a few reputable men. And it is not reasonable to suppose that either group is entirely wrong, but rather that they are right on one point at least or even on most of them" (*NE* I 8 1098^{b}27–29). Later he generalizes the claim: "things that seem to be so to everyone, these, we say, *are*" (X 2 1172^{b}36–1173^{a}1). Raw starting-points are just that—raw. But when refined some shred of truth is likely to be found in them. So likely, indeed, that if none is found, this will itself be a surprising fact needing to be explained: "when a reasonable explanation is given of why an untrue view appears true, this makes us more convinced of the true view" (VII 14 1154^{a}24–25).* It is the grain of truth enclosed in a reputable belief that a philosopher or scientist is interested in, then, not in the general acceptability of the surrounding husk, much of which he may discard.

The process of refinement in the case of a candidate explanatory starting-point is that of testing a definition of it against reputable beliefs. This may result in the definition being accepted as it stands or in its being altered or modified: when a definition is non-perspicuous, Aristotle tells us at *Top.* VI 13 151^{b}7–8, it must be "corrected and reconfigured (*sundiorthôsanta kai suschêmatisanta*)," until it is made clear. The same process applies to

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*Compare: "What we are about to say will also be more convincing to people who have previously heard the pleas of the arguments disputing them" (*Cael.* I 10 279^{b}7–9); "refutations of those who dispute them are demonstrations of the contrary arguments" (*EE* I 3 1215^{a}6–7).

the reputable beliefs themselves, since they may conflict not only with the definition but also with each other. Again, this may result in their being modified, often by uncovering ambiguities within them or in the argument supporting them, or by drawing distinctions that uncover complexities in these, or they may be rejected entirely, provided that their appearance of truth is explained away.

The canonical occasion for the use of honest dialectic, as of the Socratic elenchus and plain dialectic, is the examination of a respondent. The relevant premises for the questioner to use, therefore, are the reputable beliefs in his catalogue that his respondent will accept. Just how wide this set of beliefs is in a given case depends naturally on how accessible to untrained respondents the subject matter is on which he is being examined. We may all have some beliefs about thunder and other phenomena readily perceptible to everyone and which are—for that very reason—reputable. But about fundamental explanatory notions in an esoteric science we may have none at all.

When a scientist is investigating by himself, the class of premises he will select from is the catalogue of *all* the raw starting-points of his science, despite a natural human inclination to do otherwise:

> [People] seem to inquire up to a certain point, but not as far as it is possible to take the puzzle. For it is customary for all of us to make our inquiry not with an eye to the thing at hand but with an eye to the person who says the contrary. For a person even inquires within himself up to the point at which he is no longer able to argue against himself. That is why a person who is going to inquire well must be capable of objecting by means of objections proper to the relevant genus, and this comes from having a theoretical grasp on all the differentiae. (*Cael.* II 13 294^{b}6–13)

Hence a scientist will want to err on the side of excess, adding any reputable belief that appears to have any relevance whatsoever to his catalogue. When he formulates definitions of candidate scientific starting-points from which he thinks he can demonstrate the raw ones, he must then examine himself to see whether he really does have the scientific knowledge of it that he thinks he does. If he is investigating together with fellow scientists, others may examine him: we all do better with the aid of co-workers (*NE* X 7 1177^{a}34). What he is doing is using honest dialectic on himself or having it used on him. But this, we see, is little different from the final stage—stage (4)—of the induction we looked at earlier. Induction, as we might put it, is in its final stage (possibly self-directed) honest dialectic.

In a famous and much debated passage, Aristotle writes:

> We must, as in the other cases, set out the things that appear to be so, and first go through the puzzles, and, in that way, show preferably all the reputable beliefs about these ways of being affected, or, if not all of them, then most of them and the ones with the most authority. For if the objections are refuted and the reputable beliefs are left standing, that would be an adequate showing. (*NE* VII 1 1145^{b}2–7)

The specific topic of the comment is "these ways of being affected," which are self-control and its lack as well as resilience and softness, as in the parallel passage in the *Physics* that we looked at, namely IV 4 211^{a}7–11, it is about place. Some people think that it applies only to this topic and should not be generalized, even though "as in the other cases" surely suggests a wider scope. And, as we can now see that scope *is* in fact entirely general, since it describes the honest dialectical or inductive route to the starting-points of *all* the sciences and methods of inquiry, with *tithenai ta phainomena* ("setting out the things that appear to be so") describing the initial phase in which the raw starting-points are collected and catalogued.

Now that we know what it means for honest dialectic of the sort employed by the philosopher to provide a route to the explanatory starting-points of the philosophical sciences, we are in a position to see that it is just such a route that the *Physics* takes to those of universal natural science. For nature, cause, place, time, and movement, as well as all the others, are indeed common to all the genus-specific natural sciences and special to none. No wonder, then, that Aristotle himself refers to Book III as *ta peri tas archas*—"the discussion of the starting-points" (*Cael.* I 6 274^{a}21). Since this route is the sort any science must take in order to show its explanatory starting-points, the investigation undertaken in the *Physics* is indeed a scientific one. It is not, to be sure, a demonstration from the starting points of natural science, but rather a showing of the starting-points themselves, which, if successful, allows us to achieve the sort of puzzle-free grasp on them that comes with genuine understanding.

The Audience for the Physics

In the *Nicomachean Ethics*, Aristotle famously tells us that it is not a work for young or immature people, inexperienced in the practical matters with which it deals:

> But each person correctly discerns the things he knows and is a good discerner of these. Hence a person well educated in a given area is a good discerner *in that area*, while a person well educated in all areas is an unconditionally good discerner. That is why a young person is not a suitable audience for politics. For he has no experience of the actions of life, and the accounts are in accord with these and concerned with these. (*NE* I 3 1094^b25–1095^a4)

Though less often recognized, he issues a similar warning in the *Metaphysics*, and there as in the *Ethics*, he makes being well educated a prerequisite:

> That is why we should already have been well educated in what way to accept each argument, since it is absurd to look for scientific knowledge and for the way characteristic of scientific knowledge at the same time—and it is not easy to get hold of either. Accordingly, we should not demand the argumentative exactness of mathematics in all cases but only in the case of things that include no matter. (*Met.* II 3 995^a12–16)

But whereas in the case of ethics and politics the relevant experience is practical, in metaphysics it is theoretical. There we need experience in life. Here we need experience in the sciences. And in both we need the sort of training in honest dialectic, as in logic and what we would call the philosophy of science, for which the treatises in the so-called *Organon* (*Categories*, *De Interpretatione*, *Prior* and *Posterior Analytics*, *Topics*, and *Sophistical Refutations*) might serve—or might once have served—as a textbook.

Now it is true that there is no comparable warning to be found within the *Physics* itself, which never mentions its intended audience or what it requires of them. But in a passage in the *Nicomachean Ethics* a requirement is explicitly mentioned:

> While young people become geometers and mathematicians and wise in such things, they do not seem to become practically-wise. The explanation is that practical wisdom is concerned also with particulars, knowledge of which comes from experience. But there is no young person who is experienced, since it is quantity of time that produces experience. (Indeed, we might also investigate why it is that a child can become a mathematician but not a theoretically-wise person or a natural scientist. Or isn't it that the objects in mathematics are given through abstraction, while the starting-points in theoretical wisdom or

> natural science come from experience, so that the young lack conviction there but only talk the talk, whereas in mathematics it is quite clear to them what each of the objects is? (*NE* VI 8 1142^{a}13–29)

The *Physics*, then, is no more for the inexperienced than the *Nicomachean Ethics* or the *Metaphysics*, although in its case the experience is presumably in the genus-specific natural sciences, Aristotle's own philosophy of science, and in dialectic. The following two passages indicate as much:

> We shall next argue that this is also the only way to resolve the puzzle of the ancient thinkers. For those who were the first to inquire philosophically into the truth and the nature of beings were turned aside, and as it were diverted from their route, by their inexperience, and say that none of the beings either comes to be or passes away, because what comes to be must come to be either from what is or from what is not, both of which are impossible. (*Ph.* I 8 191^{a}23–29)

> For even if things are truly in this state, as certain people assert, and being is unlimited and immovable, at least it does not at all appear to be that way according to perception, but instead many beings appear to be in movement. If indeed, then, there is false belief, or belief at all, or even if there is imagination, or if things seem to be sometimes one way and sometimes another way, there is also movement. For imagination and belief seem to be sorts of movements. But to investigate this question at all, and to seek an argument when we are too well off to need an argument, is to be a bad discerner of what is better and what is worse, and what is trustworthy and what is not trustworthy, and what is a starting-point and what is not a starting-point. (*Ph.* VIII 3 254^{a}24–33)

There is much in the *Physics*, then, that its readers are supposed to know already. When it is simply information or arguments that are at issue, notes can provide what we need. But there is more to being well educated than being well informed; we must also be the intellectual equivalent of morally virtuous.

When dialectic has done its testing of the opposing sides of a puzzle, we hear in the *Topics*, it "only remains to make a correct choice of one of them" (VIII 14 163^{b}11–12). And what enables us to make such a choice is the "naturally good disposition (*euphuia*)" that enables people to "discern correctly what is best by a correct love or hatred of what is set before them" (163^{b}15–16). The reference to "what is best" suggests that this disposition is the *euphuia* also referred to also in the following passage:

> His seeking of the end in question is not self-chosen, rather, we must be born possessed of a sort of sight by which to discern correctly and choose what is truly good, and a person in whom this by nature operates correctly is naturally well disposed (*euphuês*). For this is what is greatest and noblest and is not the sort of thing we can get from someone else or learn but the sort of thing whose condition at birth is the one in which it will later be possessed and, when it is naturally such as to be in a good and noble condition, will be the naturally good disposition (*euphuia*) in its complete and true form. (*NE* III 5 1114^{b}5–12)

And that, in fact, is what the distinction between philosophy and sophistry, which uses all of plain dialectic's resources, might lead us to expect, since "philosophy differs from dialectic in the way its capacity is employed, and from sophistic in the life it deliberately chooses" (*Met.* IV 2 1004^{b}23–25).

Now a deliberate choice of how to live is at bottom a choice of an ultimate end or target for our life: "everyone who can live in accord with his own deliberate choice should adopt some target for the noble life, whether honor, reputation, wealth, or education, which he will look to in all his actions" (*EE* I 2 1214^{b}6–9). And what "teaches *correct* belief" about this end or target, thereby ensuring that the deliberate choice of it is correct, is "natural or habituated virtue of character" (*NE* VII 8 1151^{a}18–19). It is this, we may infer, in which the naturally good disposition under discussion consists. Hence if we possess it, and it has been properly developed by a good upbringing and education, when we hear from ethics that the starting-point it posits as the correct target for a human life is "activity of the soul in accord with virtue, and if there are more virtues than one, in accord with the best and most complete" (I 7 1098^{a}16–18), we will accept it as true, and so strive to clear away the puzzles in such a way as to sustain its truth. If we do not possess it, we will reject this starting-point, so that in our choice between the conflicting sides of these puzzles, we will go for the wrong ones: "the truth in practical matters must be discerned from the facts of our life, since these are what have the controlling vote. When we examine what has been previously said, then, it must be discerned by bringing it to bear on the facts of our life, and if it is in harmony with the facts, we should accept it, but if it clashes, we should suppose it mere words" (X 8 1179^{a}17–22).

In the *Rhetoric*, we learn of an apparently different sort of good natural disposition which might seem from the company it keeps to be an exclusively intellectual trait: "good natural disposition, good memory, readiness to learn, quick-wittedness . . . are all productive of good things" (I 6 1362^{b}24–25). When it comes to solving dialectical problems bearing on "truth and knowledge," we might conclude, such apparently intellectual good natural disposition is all we need, even if, when it comes to those bearing on "pursuit and avoidance" (*Top.* I 11 104^{b}1–2), we also need its apparently more ethical namesake. It would be a mistake, though, to rush to this conclusion. For the ultimate starting-point and cause that the *Metaphysics* finally uncovers, which is at once the active understanding of active understanding, the prime unmoved mover, and the primary god, is the ultimate cause and starting-point for beings qua beings—*all of them*. And that means that it is our ultimate starting-point and cause too.

When we look at our lives from the outside, so to speak, from the theoretical point of view, if the *Metaphysics* is right, we see something amazing, namely, that the heavenly bodies, those bright denizens of the starry heavens above, are living beings who, like us, are moved by a desire for the best good—for the god (XII 7). When we view our lives from the inside, from that perspective from which "the truth in practical matters" can alone be discerned, the *Ethics* tells us that we will find that we are moved by the same thing—that as the good for the heavenly bodies consists in contemplating the primary god, so too does our happiness: "The activity of a god, superior as it is in blessedness, will be contemplative. And so the activity of humans, then, that is most akin to this will most bear the stamp of happiness" (*NE* X 8 1178^{b}21–23). But Aristotle's hand is tipped also within the *Metaphysics* itself:

> [Active understanding rather than receptive understanding] seems to be the divine element that understanding possesses, and contemplation seems to be most pleasant and best. If, then, that good state [of activity], which we are sometimes in, the [primary] god is always in, that is a wonderful thing, and if to a higher degree, that is yet more wonderful. But that is his state. And life too certainly belongs to him. For the activity of understanding is life, and he is that activity; and his intrinsic activity is life that is best and eternal. We say, then, that the god is a living being that is eternal and best, so that living and a continuous and everlasting eternity belong to the god, since this is the god. (*Met.* XII 7 1072^{b}22–30)

That is why "we should not, in accord with the makers of proverbs, 'think human things, since you are human' or 'think mortal things, since you are mortal' but rather we should as far as possible immortalize, and do everything to live in accord with the element in us that is most excellent" (*NE* X 7 1177^b31–34), this being our understanding—our divine *nous*.

Aristotle arrives at this great synthesis of theory and practice, as we saw, on empirical grounds, by reflecting on, and drawing inductive conclusions from, the various sciences—theoretical, practical, and productive—as they existed in his day. He is not doing "armchair" philosophy, but rather drawing on his own vast knowledge of these sciences to reach a unified explanatory picture of being as such and our place in it, as practical agents and theorizers. If we followed in his footsteps, drawing on *our* sciences, from theoretical physics to engineering, economics, and ethics, we would not reach his conclusions about the primary starting-points and causes of beings qua beings. If we are to be Aristotelians now it cannot be by parroting Aristotle's theories. Instead, it must be by taking him as a paradigm of how we might be philosophers ourselves—a "paradigm in the heaven," so to speak, "for anyone who wishes to look at it and to found himself on the basis of what he sees" (Plato, *Rep.* IX 592b1–2).

Physics

Book I

I 1

Since in all methodical inquiries in which there is knowledge—that is, scientific knowledge—of things that have starting-points, causes, or elements, it comes from knowledge of these (for we think that we know each thing when we know its primary causes and primary starting-points, all the way to its elements), it is clear that in the scientific knowledge of nature our first task must be to try to determine the starting-points.[1]

And the natural route is from things that are knowable and more perspicuous to us to things that are more perspicuous and more knowable by nature, since the same things are not knowable to us as are knowable unconditionally.[2] That is why we must in this way advance from things that are less perspicuous by nature but more perspicuous to us to the things that are more perspicuous by nature and more knowable.

And the things that are in the first instance clear and perspicuous to us are rather confused. It is only later, through a division of these, that we come to know their elements and starting-points. That is why we must proceed from the universals to the particulars.[3] For it is the whole that is more knowable by perception, and the universal is a sort of whole. For the universal embraces many things as parts. The same thing happens in a way with names in relation to their account. For a name like "circle" signifies a sort of whole in an undivided way, whereas the definition divides it into its particular [elements].[4] And children at first suppose all men to be their fathers and all women their mothers, only later coming to divide up each of them.[5]

I 2

There must, then, be either one starting-point or several, and, if one, it must be either immovable, as Parmenides and Melissus say, or in movement, as the physicists say, of whom some state air to be the primary starting-point, others water.[6] But if there are several, they must be either limited in number or unlimited, and, if limited, but more than one, then either two, three, four, or some other number, whereas if there are an unlimited number, then either they are, as Democritus held, one in genus but differing in shape or in species, or they are also contraries.[7]

Those who inquire into how many beings there are inquire in a similar way.[8] For they are inquiring about the primary things of which the beings are composed, as to whether they are one or many, and if many, whether limited or unlimited in number.[9] So they are [really] inquiring about whether the starting-points or elements are one or many.

Now to investigate whether being is one and immovable is not to make an investigation concerning nature. For just as a geometer has no further argument against someone who does away with the starting-points of geometry—this being a matter for another science or one that is common to all—so it is too where starting-points are concerned.[10] For there will no longer be a starting-point if being is one thing only, and one in this way, since a starting-point must be a starting-point of some thing or things.

To investigate, then, whether being is one in this way is like dialectically discussing any other thesis that is stated for the sake of argument, like that of Heraclitus, or (if anyone were to state it) that being is one human being, or like refuting a contentious argument—which is just what the arguments of Melissus and Parmenides involve.[11] For in fact they assume falsehoods and argue invalidly—or rather, the argument of Melissus is crude and involves no puzzle.[12] Grant him one absurdity and the others follow—nothing difficult in this.[13]

As for ourselves, we must assume that the things that are by nature are in movement, either all of them or some of them. And this is clear from induction.[14] At the same time, we should not resolve every [contentious argument] at hand, but those that involve false demonstration from the starting-points, and not those that do not.[15] For example, it belongs to the geometer to refute a quadrature by means of segments, but not one like Antiphon's.[16] Nevertheless, although they [Melissus and Parmenides] are concerned with nature, but the puzzles they speak about are not natural scientific ones, perhaps it would be good to discuss them briefly, since the investigation involves philosophy.[17]

The starting-point that is most proper of all [to such an investigation] is to see—since something is said to be in many ways—in what way they maintain that all things are one.[18] Do they mean that all are substance, or quantities, or qualities?[19] And, again, do they mean that all are one substance—for example, one human being or one horse or one soul?[20] Or quality, and that it is one—for example, pale, or hot, or something else of that sort?[21] For these are all very different and all impossible to maintain. For if there is to be both substance and quality and quantity, then whether these are detached from each other or not, the beings will be many. If on the other hand everything is quality or quantity, then, whether substances exist or not, something strange

30 results—if the impossible should be said to be [merely] strange! For none of the others is separable or beyond substance, since all of them are said of an underlying subject—the substance.[22]

Now Melissus says that being is unlimited.[23] Therefore, being is some quantity. For the unlimited is in [the category of] quantity, whereas a substance, quality, or affection cannot be unlimited except coincidentally,
185^{b}1 that is, if they were at the same time also quantities.[24] For the account of the unlimited makes use of quantity, but not of substance or of quality.[25] If, then, there is substance and quantity as well, being is two, and not one. And if there is substance only, it is not unlimited—in fact, it has no magnitude at all. For if it did, some quantity will have to exist.

5 Further, since things are said to be one in many ways, just as they are said to be in many, we must investigate in what way they maintain that the universe is one.[26] Now things are said to be one if they are continuous, or indivisible, or if the account of their essence is one and the same, like liquor and booze.[27]

Accordingly, if [1] continuous [is the relevant way of being one], then their being is many, since the continuous is divisible without
10 limit.[28]

There is, however, a puzzle about part and whole—although not perhaps relevant to the argument, but an intrinsic one—as to whether part and whole are one or several, and in what way one or several, and if several, in what way several. (And [the same puzzle arises] about parts that are not continuous.) Also, if each of two parts is one with the whole, as being indivisible from it, [there is the puzzle] that they will
15 also be one with each other.

But then if [2] it is as being indivisible [that their one is one], then in nothing at all will there be a quality or a quantity, nor will being be unlimited, as Melissus says, or limited, as Parmenides does.[29] For it is limits that are indivisible, not limited things.[30]

But then if all beings are one in account, like clothing and apparel,
20 then it follows that they are stating the Heraclitean argument.[31] For the being for good and for bad, for good and for not good, will be the same, so that to be good and to be not good, to be human and to be horse, will be the same, and their argument will be, not that all beings are one, but that they are nothing at all—and the being for such-and-
25 such quality and for such-and-such quantity will be the same.[32]

Even the more recent of the ancient thinkers were causing a disturbance lest the same thing should turn out to be both one and many at the same time. That is why some of them, like Lycophron, did away with the "is," while others remodeled the language, and said not "the

human is pale" but "the human has paled," and not "the human is
walking" but "the human walks," lest by adding the "is" they would 30
make the one be many—as if things were said to be or to be one in
only one way.[33] The beings, however, are many, either in account (for
example, being for pale is distinct from being for musical, although
the same thing may be both, and the one therefore many) or by divi-
sion, like the whole and its parts. And at this point they were already
involved in puzzles and agreeing that the one is many—as if it were **186a1**
not possible for the same thing to be both one and many, provided
that these are not opposites. For a thing can be one either potentially
or actually.[34]

I 3

If we approach the thesis in this way, then, it appears to be impossible
for the beings to be one. Also, the arguments on the basis of which
these thinkers [try to] show it are not difficult to refute. For both of 5
them—both Melissus and Parmenides—contentiously deduce it.[35]

It is clear, indeed, that Melissus argues fallaciously. For he thinks that 10
if he has as an assumption that whatever comes to be has a starting-
point, he also has that whatever has not come to be does not have one.[36]
Next, this also is absurd: that in all cases there is a starting-point of the
thing—not of the time—and not [merely] of unconditional coming to
be but also of alteration, as if change never came about all at once.[37] 15
Next, why is the universe immovable, if it is one? For if a part of it
that is one—for example, this water here—can be moving within itself,
why can't the universe also be moving within itself?[38] Next, why should
there be no such thing as alteration?

Moreover, being cannot be one in species either, except in the sense
of what it is composed of (even some of the physicists speak of it as one
in this, but not in the former, way). For human is distinct in species 20
from horse, and contraries from each other.[39]

And against Parmenides the ways of arguing—besides any that may
be special to him—are the same. In fact, the resolution [of his argu-
ment] is in part that it is false and in part that it does not follow. His
assumption that things are said to be unconditionally is false, since
they are said to be in many ways.[40] As for what does not follow, sup- 25
pose that there are only pale things and that "pale" signifies one thing,
nonetheless the pale things will be many and not one. For the pale will
not be one by being continuous, nor by being one in account.[41] For the
being for pale will be distinct from the being for its recipient.[42] And
there will not be anything beyond the pale that is separable, since they

are not distinct by being separable but because the being for pale and for what it belongs to are distinct.[43] But this Parmenides did not get far enough to see.[44]

He must assume, then, not only that "being" signifies one thing, whatever it is predicated of, but also that it signifies just being and just one.[45] For a coincident is said of some underlying subject, so that if being is a coincident, the underlying subject will not be (for it is distinct from being), and, therefore, there will be something that is not.[46] Just being, then, could not belong to something else. For it would not be possible for it to be a being, unless "being" signifies more than one thing, such that each is a sort of being. But it was assumed that "being" signifies one thing.

If, on the other hand, just being is not a coincident of other things, but other things are coincidents of it, why does "just being" signify being rather than not being? For suppose just being were also pale, but the being for pale were not just being (for even being cannot be a coincident of pale, since what is not just being will not be), then the pale will not be—and not in the sense of not being something-or-other, but of wholly not being.[47] Therefore, just being will not be. For it is true to say that it is pale, but this signified not being.[48] So even "pale" signifies just being. Therefore, "being" signifies more than one thing.

Nor, accordingly, will being have magnitude, if indeed being is just being, since the being of each of the two components would be distinct.

That just being is divided into another just being is evident even from the [definition of an] account.[49] For example, suppose the human is just being, then the animal is also just being, as is the two-footed.[50] For otherwise, they will be coincidents, either present in the human or in some other subject. But this is impossible. For something is said to be a coincident either if it is such that it can belong or not belong, or if that to which the coincident belongs is present in the account of it.[51] For example, being seated is a coincident as separable, and in the snub belongs the account of the nose with which we say the snub is coincident.[52] Further, whatever is present in the definitional account of something, or of which the account is composed, must be such that in the account of it the account of the whole thing is not present—for example, in the two-footed that of the human, or in the pale that of the pale human. Accordingly, if this is the way things are, and if the two-footed is a coincident of the human, then either it must be separable from the human, so that it would be possible for the human not to be two-footed, or else the account of the human would be present in the account of the two-footed. But this is impossible, since the latter is present in the account of it.

If, on the other hand, the two-footed and the animal are coincidents of something else, and if each of them is not just being, then the human too would be a coincident of something else. But we must take it that just being is not a coincident of anything at all, and that if both of two things are said of something, so also must that which they compose. The universe, therefore, will be composed of indivisibles.[53]

Some thinkers did, in fact, give in to both arguments: to the argument that all things will be one if "being" signified one thing, **187a1** when they posited that not being will exist; and to the argument from the division into two things, when they posited indivisible magnitudes.[54]

It is evident, though, that it is not true that if "being" signifies one thing, and not at the same time the contradictory of this, then not being will not exist. For nothing prevents not being from not being *something*, but from *simply* not being.[55] And it is absurd to say that if nothing else exists beyond being itself, then all things will be one. For who does learn about being itself if there were not something for just being to be?[56] And if that is so, then there is nothing to prevent there being many beings from being, as we said.

It is clear, then, that it is impossible for being to be one in the way claimed.

I 4

The physicists on the other hand state things in two ways. [1] Some make the underlying body one—either one of the three or something else that is denser than fire and rarer than air—and then generate the other things, making them many by means of condensation and rarefaction.[57] Now these are contraries, which taken universally are excess and deficiency, as are the great and the small in Plato, except that he makes these be matter, and the one be form (*eidos*), whereas they make the one the underlying matter and the contraries be differentiae (*diaphora*), that is, forms (*eidos*).[58]

[2] Others say that the contrarieties are present in the one and are segregated out of it—for example, Anaximander speaks like this, as do those, such as Empedocles and Anaxagoras, who say that the beings are one and many.[59] For they too segregate out the others from the mixture.[60] They differ from each other, however, in that Empedocles posits a cycle of mixings and segregations, whereas Anaxagoras posits just one, and Anaxagoras posits an unlimited number both of homoeomerous things and of contraries, whereas Empedocles posits the so-called elements only.[61]

Anaxagoras seems to think that these are unlimited in this way because he accepted as true the common belief of the physicists that nothing comes to be from not being. For it is because of this that they say that "all things were together" and that he makes a thing's coming to be such-and-such a sort of thing an alteration, while they make it aggregation and disaggregation.[62]

Further, there is the fact that contraries come to be from each other. Therefore, they must have been there from the start. For if everything that comes to be must do so either from being or from not being, and if it is impossible for it to come to be from not being (and in this belief all those concerned with nature are agreed), they regarded the remaining alternative as immediately following by necessity, namely, that things come to be from beings that are already present but that, because of the smallness of their volume, are imperceptible to us.[63]

That is why they say that everything has been mixed together in everything: because they saw everything coming to be from everything.[64] But things appear different from one another, and are called by distinct names, depending on what is numerically predominant throughout the mixture of the unlimited particles. For they say that no whole thing is purely pale, dark, sweet, flesh, or bone, but whichever it has most of is what seems to be the nature of the thing.[65]

Now if the unlimited insofar as it is unlimited is unknowable, then the unlimited in number or with respect to magnitude is an unknowable quantity, and the unlimited in form (*eidos*) is an unknowable quality.[66] If, then, the starting-points are unlimited both in number and in form, there can be no knowledge of the things they compose. For we think we have got hold of knowledge of a composite when we know the things it is composed of and what their quantity is.

Further, if a part can be of any size whatsoever in the direction of greatness and of smallness, then it must also be possible for the thing itself be so (by "parts" I mean components present in the whole into which the whole can be divided). If, on the other hand, it is impossible for an animal or a plant to be of any size whatsoever, in the direction of greatness and of smallness, it is evident that none of its parts can be either.[67] For if it could, so similarly could the whole. But flesh and bone and things of that sort are parts of an animal, and fruits are parts of plants. It is clear, therefore, that it is impossible for flesh or bone or any other such thing to be of any size whatsoever, either in the direction of greatness or in the direction of smallness.

Further, if all such things are already present in each other, and do not come to be but instead, being present within, are segregated out; and if they are called [what they are] after whatever there is more of; and if anything can come to be from anything (for example, if water can be segregated out from flesh, and flesh from water); and if every limited body is done away with by [subtracting] a limited body: it is evident that it is not possible for everything to be present in everything. For if flesh is subtracted from water, and if this is done again by segregation from what remains, even if what is subtracted is always smaller, still it will not be smaller than a certain magnitude.[68] So, if the process of segregation comes to a stop, not everything will be present in everything (for there will be no flesh in the remaining water); but if it does not come to a stop, but subtraction is always possible, there will be an unlimited number of equal limited parts in a limited magnitude. But this is impossible.

In addition to these considerations, if every body from which something is subtracted must become smaller, and if flesh is definite in quantity, both in greatness and in smallness, it is evident that from the smallest possible quantity of flesh no body can be segregated out. For otherwise there will be a quantity of it smaller than the smallest possible one.

Further, in each of the unlimited bodies there would be already present unlimited flesh, blood, and brain, not indeed separated from each other, but beings nonetheless, and each unlimited. But this is unreasonable.

The statement that segregation will never [be complete] is not made on the basis of knowledge, but it is correct. For attributes are inseparable.[69] If, then, colors and states were mixed together, if they got segregated out, there would be a pale or a healthy that is not another thing, and is not predicated of a subject either.[70] So *nous* is absurd, since it is seeking impossible things, if indeed it wishes to separate them, although it is impossible to do this, both with respect to quantity and with respect to quality: with respect to quantity, because there is no smallest magnitude; with respect to quality, because attributes are inseparable.[71]

Nor is Anaxagoras correct even about the coming to be of things of the same form.[72] For there is a way in which mud is divided into mud, and a way in which it is not.[73]

Moreover, the way in which bricks come from a house and a house from bricks is not the same as the way in which water and air are and come from each other.[74] Also it is better to assume a smaller number of starting-points, just as Empedocles does.[75]

I 5

All thinkers, then, posit contraries as starting-points, both those who
say that the universe is one and not moving (for in fact Parmenides
20 posits hot and cold as starting-points, though he calls them by the
names “fire” and “earth”[76]) and those who make use of the rare and
the dense. Also, Democritus, who posits plenum and void (saying that
the one is present as being, the other as not being), but further pos-
its position, shape, and order.[77] And these are genera of contraries—
for example, of position, up and down, in front and behind; of shape,
25 angular and angle-less, straight and curved.

It is clear, then, that all in some way posit contraries as starting-points. And this is reasonable. For the starting-points must come neither from each other nor from other things, and all things must come from them. And to the first contraries these features belong: because they are first they do not come from other things, and because they are contraries they do not come from each other.

30 But how this conclusion follows must also be investigated by appeal
to argument.[78] Let us first take it, then, that no being whatsoever is
by nature such as to do or suffer any random thing due to any ran-
dom thing, nor does anything come to be from just anything, except
if one takes a coincidental case.[79] For how could pale come to be from
35 musical, unless musical were coincident with the not pale or with the
dark?[80] Instead, pale comes from not pale—and not from any not pale
but from dark, or something intermediate between the two. And musi-
188b1 cal comes to be from not musical—except not from any not musical
but from unmusical, or something intermediate between the two, if
there is such.

Nor again do things pass away into the first random thing—for
example, the pale does not pass away into the musical, except coinci-
5 dentally, but into the not pale, and not into any random one but into
the dark or the intermediate. Similarly too the musical passes away
into the not musical, and not into any random one but into the unmu-
sical or into some intermediate, if there is such.

It is also the same in all other cases, since the same account also
holds of the beings that are not simple but composite.[81] But because
10 the opposite dispositions have no names, this escapes notice.[82] For in
all cases the harmonious must come to be from the unharmonious and
the unharmonious from the harmonious, and the harmonious must
pass away into the unharmonious, and not into any random one but
into the opposite one. And it makes no difference whether we speak of
15 harmony, order, or composition, since it is evident that the account is

the same. Moreover, a house too, and a statue, and any other such thing whatsoever comes to be in the same way. For the house comes to be from the non-combination, or rather division, of these things in this way, and the statue, or anything else that is shaped, comes to be from shapelessness.[83] And each of these things is on the one hand an order, and on the other a sort of composition.[84]

Accordingly, if this is true, everything that comes to be comes to be from, and everything that passes away passes away into, its opposite or an intermediate. But the intermediates are [composed] of contraries—for example, colors from black and white.[85] So all the things that come to be by nature are either contraries or [composed] of contraries.

Up to this point most of the others pretty much followed along with us, as we said earlier.[86] For they all posit the elements and the things they call starting-points as contraries, even if they do so without argument, as if compelled by the truth itself.[87] But they differ among themselves in that some take contraries that are prior, some contraries that are posterior, some contraries that are more knowable by reason, others that are more knowable by perception.[88] For some posit hot and cold as the causes of coming to be, others wet and dry, others odd and even or strife and love, and these differ from each other in the way just stated.[89]

So the starting-points they stated are in one way the same, in another way distinct—distinct in the way that most people believe; the same insofar as they are analogous. For they are taken from the same column of contraries, some of which encompass [others], whereas others **189b1** are encompassed.[90] In this way, then, they spoke of them as similarly and distinctly, better and worse, and some as more knowable by reason, as we said earlier, others by perception (for the universal is known by reason, the particular by perception, since reason is of a universal, whereas perception is of a particular)—for example, the great and the small are known by reason, the rare and the dense by perception.[91]

It is evident, then, that starting-points must be contraries.

I 6

We must next say whether they are two, three, or more in number. For they cannot be one, since contraries are not one, and they cannot be unlimited, since if they were, being would not be scientifically knowable.[92] Also, in any one genus there is just one contrariety, and substance is one genus.[93] Moreover, it is possible [to generate everything] from a limited number, and it is better to do so from a limited number, like Empedocles, than from an unlimited one. For Empedocles thinks that he gives an account of all things just as Anaxagoras does from his unlimited number. Further, some pairs of contraries are prior to others, and some come to be from others, such as sweet and bitter, white and black, whereas the starting-points must always remain.[94] It is clear from these considerations that they are neither one nor unlimited in number.

Since, then, the starting-points are limited in number, there is some reason not to make only two of them. For one might raise the puzzle as to how density could be by nature such as to affect rarity, or rarity density, at all. And similarly for any other contrariety whatsoever. For love does not gather strife together and make something from it, nor does strife do so from love, but both affect a third distinct thing. And some thinkers assume more than one such thing from which they construct the nature of the beings.[95]

And in addition to this, if no nature distinct from the contraries is assumed, one may also raise this further puzzle. We never in fact see contraries constituting the substance of the beings. For what is a starting-point ought not to be something that is said of an underlying subject.[96] For if it is, there will be a starting-point of the starting-point. For the underlying subject is a starting-point, and seems to be prior to what is predicated of it.[97] Further, we say that substance is not contrary to substance.[98] How, then, can substance be [composed] from what are not substances? Or how could what is not substance be prior to substance?

That is why, if someone considers both the former argument and this one to be true, he must, if he is going to preserve both, posit some third thing that underlies [the contraries], like the one spoken of by those who say that the universe is one nature, such as water or fire or what is intermediate between the two.[99] What is intermediate, though, seems more [of a starting-point], since fire, earth, air, and water are already involved with contrarieties.[100] That is why indeed those who make the underlying subject something distinct from these—or the ones who of these elements make it air—make it so not without reason.[101] For, of these, air too has the least perceptible differentiae, and after it, water.[102] Yet *all* these thinkers give shape to this one thing by means of contraries, that is, by means of density and rarity and the more and the less.[103] And these taken generally are clearly excess and deficiency, as was stated previously.[104] Indeed this doctrine too—that the one and excess and deficiency are starting-points of the beings—would seem to be an ancient one, except that it is not stated in the same way. For the ancient thinkers made the two active and the one passive, whereas some of the more recent ones stated the contrary instead, that the one does the affecting and the two the being affected.[105]

There would seem, then, on the basis both of these and other such considerations, that there is some reason to think that the elements are three in number, as we said, but no longer any to think that there are more than three.[106] For one is sufficient for being affected, while, if there are four, there will be two contrarieties, and a separate intermediate nature will be needed for each.[107] If, on the other hand, being [just] two, they can generate things out of each other, then one of the two contrarieties would be superfluous.[108] Moreover, it is impossible for there to be more than one first contrariety. For substance is one genus of being, so that the starting-points can differ only in being prior or posterior to each other, and not in genus. For in any one genus there is always one contrariety, all the other contrarieties seeming to be referred back to one.

It is evident, then, that the elements are neither one in number, nor more than two or three—but whether they are two or three involves, as we said, much puzzlement.[109]

I 7

We shall now give our own account, first discussing all cases of coming to be, since the procedure that is in accord with nature is first to say what is common to all cases, and then to get a theoretical grasp on what is special to each one.[110]

For we say that one thing comes to be from another, indeed, a distinct one from a distinct one, whether speaking about simple things or about compound ones.[111] I mean this: it is possible for the human to become musical, it is possible for the not musical to come to be musical or for the not musical human to come to be a musical human. By a simple thing that comes to be [something], then, I mean the human and the not musical, and by a simple thing that [something is] coming to be, I mean the musical. By a compound one I mean both the thing that comes to be and the thing that comes to be it, whenever we say that the not musical human comes to be a musical human.

In some of these cases we say not only that *this* comes to be [something] but that it comes to be [something] from *this*—for example, musical from not musical—but we do not say it in all cases. For musical does not come from human, but rather a human comes to be musical.

Of simple things that come to be [something], some remain when they come to be [that thing], whereas others do not. For the human remains and is human when he comes to be musical, whereas the not musical and the unmusical, whether simple or compound, does not remain.

Having made these distinctions, there is this to grasp from every case of coming to be, provided we look at them in the way we described, namely, that there must always be some underlying subject that comes to be [something], and even if it is one in number, in *form* it is not one (by “in form” I mean the same as “in account”), since the being for the human is not the same as the being for the unmusical.[112] And the one remains and the other does not remain. The thing that is not an opposite remains (for the human remains), but the not musical and the unmusical do not remain, and nor does the thing composed of both—for example, the unmusical human.

We say that something comes to be [something] from something, and not that it comes to be something, chiefly in the case of what does not remain—for example, that musical comes to be from unmusical, but not that it does so from human. Nonetheless, we do sometimes speak in this way about what does remain, since we say that a statue comes from bronze, not that the bronze comes to be a statue. As for what comes to be from what is opposite and does not remain, we speak of it in both ways, saying both that it comes to be *from this* and that it comes to be *this*. For we say both that from unmusical it comes to be musical and that the unmusical comes to be musical. That is why we also say the same about the compound. For we say both that from an unmusical human the musical human comes to be and that the unmusical human comes to be musical.

Things, though, are said to come to be in many ways, and some things are said not to come to be but to come to be a *this something*, whereas only substances are said to come to be unconditionally.[113] In the other cases, by contrast, it is evident that there must be some underlying subject that comes to be [something]. For when a quality, a quantity, a relation to something else, or a place comes to be, it is *of* some underlying subject, because a substance is the only thing that is never said of any other underlying subject, whereas all the others are said of a substance.

But that substances—that is, the things that are unconditionally beings—also come to be from an underlying subject will become evident on investigation.[114] For in every case there is something that underlies, from which the thing comes to be—for example, plants and animals come to be from seed.

And of the things that unconditionally come to be, some do so by change of figure (for example, a statue), some by addition (for example, things that grow), some by subtraction (for example, [the statue of]

Hermes from the stone), some by composition (for example, a house), some by alteration (for example, things changing with respect to their matter). And it is evident that everything that comes to be in this way comes to be from an underlying subject.

So it is clear from what has been said that whatever comes to be is always composite, and there is one thing that comes to be, and another that comes to be this. And the latter is twofold: either the underlying subject or the opposite. By the opposite I mean, for example, the unmusical, and by the subject, the human; and the lack of figure, the lack of shape, or the lack of order is the opposite, whereas the bronze, the stone, or the gold is the underlying subject.

It is then evident—if indeed there are causes and starting-points of the beings that are by nature, from which they primarily and not coincidentally are or have come to be the thing that each is said to be in accord with its substance—that everything comes to be from both the underlying subject and the shape.[115] For the musical human is composed of human and musical in a way, since resolutions of the account of it are into the accounts of these two.[116] It is clear, then, that whatever comes to be, comes to be from these things.

The underlying subject, however, though one in number, is two in form. For on the one hand there is the human, the gold, and in general the countable matter, which is more of a this something, and it is not coincidentally that what comes to be comes to be from it; on the other hand there is the lack (that is, the opposite), which is coincident.[117] And the form is one—for example, the order, the musicality, or anything else predicated in this way.

That is why we should say that in one way there are two starting-points, and in another way that there are three. And in one way they are the contraries—for example, if we say they are the musical and the unmusical, the hot and the cold, or the harmonious and the unharmonious. But in another way they are not, since contraries cannot be affected by each other.[118] [The resulting puzzle] is also resolved due to the fact that the underlying subject is something else, since it is not a contrary.

So in a way the starting-points are no more numerous than the contraries, but are (one might almost say) two in number, yet not two in every way either, because the being for them is distinct, but rather three. For the being for the human and for the musical are distinct, as are the being for the lack of shape and the being for bronze.

We have said, then, how many starting-points there are of natural beings that come to be, and in what way they are so many. And it is clear that there must be something to underlie the contraries, and that the contraries must be two in number. In another way, though, this is not necessary, since just one of the contraries, by its absence and presence, is sufficient to produce the change.

As for the underlying nature, it is scientifically knowable by analogy.[119] For as the bronze stands to the statue, the wood to the bed, or as what lacks a shape stands to anything else that has a shape, so the underlying nature stands to a substance, a this something, and a being.[120]

This, then, is one starting-point, although it is neither one nor a being in the way a this something is; another one, the account; and a further one is the contrary of this: the lack.[121] In what way these are two, and in what way more, has been stated above.

First, then, it was stated that only the contraries were starting-points, later, that it was necessary for there to be something else to underlie them, and for the starting-points to be three.[122] And from what we have said just now it is evident what the differentia (*diaphora*) of the contraries is, how the contraries stand to each other, and what the underlying subject is.[123] But whether the form or the underlying subject is substance is not yet clear.[124] However, that the starting-points are three, in what way they are three, and what mode [of being] they have, is clear.[125]

From these considerations, then, we should be able to get a theoretical grasp on how many starting-points there are and what they are.

I 8

We shall next argue that this is also the only way to resolve the puzzle of the ancient thinkers. For those who were the first to inquire philosophically into the truth and the nature of beings were turned aside, and as it were diverted from their route, by their inexperience, and say that none of the beings either comes to be or passes away, because what comes to be must come to be either from what is or from what is not, both of which are impossible.[126] For what is cannot come to be, since it already is, while from what is not nothing can come to be. For there must be some underlying subject [for it to come from].[127] And so, developing the consequences of this, they went on to say that there is no plurality of things but only being itself.

They embraced this belief, then, because of the foregoing considerations. We, on the other hand, say that the claim that something comes to be from what is or from what is not, or that what is or what is not affects something or is affected or comes to be a this of whatever sort, is in one way no different from the claim that the doctor affects something or is affected, or is or comes to be something from being a doctor. So, since we say this latter thing in two ways, it is clear that we also say "from what is" and "what is affects or is affected" in two ways.

Now a doctor builds a house not insofar as he is a doctor but insofar as he is a builder, and comes to be pale not insofar as he is a doctor but insofar as he is dark. But he cures and comes to be ignorant of medicine insofar as he is a doctor. So, since we in the strictest sense say that a doctor acts on something, is affected by something, or comes to be something from being a doctor, when it is insofar as he is a doctor that he acts on it, is affected by it, or comes to be it, it is clear that to say that "something comes to be from what is not" also signifies this, namely, coming to be from it insofar as it is what is not.

The ancient thinkers abandoned the puzzle through failing to make precisely this distinction, and because of their ignorance of it added so much more ignorance to it that they thought that nothing else comes to be or is [besides being itself], and thus did away with all coming to be whatsoever.

Now we too say, as they do, that nothing unconditionally comes to be from what is not, but that things do, nonetheless, come to be from what is not—for example, coincidentally.[128] For a thing comes to be from the lack, which is intrinsically something that is not, and which is not present in the thing. This, however, causes wonder, and it seems impossible that anything could come to be in this way from what is not.

Similarly, there is no coming to be either from what is or of what is, except coincidentally. But in that way this too can come about, namely, the same way as, for example, if animal comes to be from animal, and a certain sort of animal from a certain sort of animal. For example, if dog came to be from horse.[129] The dog indeed would come to be not only from animal of a certain sort, but also from animal, although not insofar as it is animal, since that belongs already. But if a certain sort of animal is to come to be, not coincidentally, it will not be from animal, and if a certain sort of thing that is, is to come to be, it will not be from a thing that is, nor from a thing that is not. For we have said what "from what is not" signifies: from what is not *insofar as it is what is not.*[130]

Further, we also do not do away with [the principle that] everything either is or is not.

This, then, is one way [of resolving the puzzle], but there is another in that the same things can be said either with respect to a capacity or with respect to an activity.[131] But this has been discussed with more exactness elsewhere.[132]

So, just as we have said, the puzzles due to which people are compelled to do away with some of the things we mentioned are now resolved. For this is why the earlier thinkers too were diverted from their route in the case of coming to be, passing away, and change generally. For if they had apprehended this nature, all their ignorance would have been dissolved.[133]

I 9

Other thinkers, indeed, have touched on this, but not adequately.[134] For in the first place they agree unconditionally that a thing comes to be from what is not, and that on this point Parmenides spoke correctly.[135] And then it appears to them that if this nature is one in number, it is also one in potentiality, which is a very different thing.

For we say that matter and lack are distinct, and that one of these, the matter, coincidentally is not, whereas the lack intrinsically is not, and that the matter is even close to being—in a way is—substance, whereas the lack is in no way substance.[136] The other thinkers, by contrast, identify the great and the small alike with what is not, whether taken together or separately.[137] So their three things and ours are entirely distinct.[138] For they got so far as to see that there must be some underlying nature, but they make it one. For even if someone [namely, Plato] makes it a dyad, calling it the great and the small, he still does the same, since he overlooks the other nature.[139]

For the nature that remains is a joint cause, together with the shape, of the thing that comes to be, just as a mother is, whereas the other part of the contrariety might often appear, if thought is focusing intensely on its production of bad effects, not to be at all.[140] For we say that there is one thing that is divine, good, and sought after, and a second that is contrary to the first, and a third that naturally yearns for the first and, in accord with its own nature, strives for it, whereas it follows on their view that the contrary strives for its own destruction.[141] Yet the form cannot yearn for itself, since it does not lack itself, and neither does the contrary (since contraries are destructive of each other), instead it is the matter that does the yearning, just as female yearns for male and ugly for beautiful—except not the intrinsically ugly, but the coincidentally so, and not the intrinsically female, but the coincidentally so.[142]

In one way too the matter passes away and comes to be, and in another way it does not. For as *that in which*, it does intrinsically pass away, since what passes away—the lack—is present in it; but as what is potentially, it does not intrinsically pass away, but must be incapable of passing away and coming to be.[143] For if it came to be, there must have been some first underlying subject from which it came to be and is present in it. This, though, is the [material] nature itself, so that it will be before coming to be [which is impossible]. (For by “matter” I mean the first underlying subject of each thing from which it not coincidentally comes to be and which is present in it.) And if it passes away, it will come to this [material nature] at last, so that it will have passed away before it has passed away [which is also impossible].

Now to make an exact determination about the starting-point in terms of form, whether it is one or many, and what it is or they are, is the function of primary philosophy, so it may be set aside till the appropriate time comes for that.[144] But about natural forms, forms capable of passing away, we shall speak in the expositions that follow.[145]

That there are starting-points, then, what they are, and how many in number they are, we may take to be determined in the foregoing way. Let us now proceed after first making a fresh start.

Book II

II 1

Of the beings, some are by nature, while others are due to other causes. Those that are by nature are animals and their parts, plants, and simple bodies—for example, earth, fire, air, and water (for we say that these and things like them are by nature). All these things evidently differ from things that are not composed by nature. For each of them has within itself a starting-point of moving and being at rest—some with respect to place, some with respect to increase and decrease, others with respect to alteration.[146]

A bed, by contrast, or a cloak, or anything else of that kind (*genos*), insofar as each such predicate applies to it—that is, to the extent that it is a product of craft—has no innate impulse to change.[147] But insofar as it is coincidentally made of stone, earth, or a mixture of the two, to that very extent, it *does* have one. This is because nature is a sort of starting-point and cause of moving and being at rest in that to which it belongs primarily, intrinsically, and not coincidentally.[148] (I say "not coincidentally" because, for example, someone who is a doctor might come to be a cause of health to himself. Nonetheless, it is not insofar as he is made healthy that he possesses the craft of medicine, but rather being a doctor and being made healthy are coincident in the same person. That is why they are separated from each other.)

Similarly too with other things that are produced. For none of them has within itself the starting-point of its own production, but in some cases (such as a house and each of the other products of handicraft) the starting-point is in something else and external, whereas in others (those that may be coincidental causes to themselves) the starting-point is in the thing but not intrinsically.[149]

Nature, then, is what has been stated. And things that have this sort of starting-point have a nature. And each of them is a substance.[150] For a substance is a sort of underlying subject, and a nature is always in an underlying subject. And these things are also in accord with nature, as too is whatever belongs intrinsically to them, as spatial movement upward belongs to fire—for this neither is nor has a nature but is by nature and in accord with nature.

We have stated, then, what nature is, what is by nature, and in accord with nature. That there is such a thing as nature it would be ridiculous to try to show. For it is evident that there are many beings of the relevant sort. And to show what is evident by means of what is not evident is characteristic of someone who cannot discern what is knowable by means of itself and what is not knowable by means of itself (and it is quite clear that this can happen to someone, since someone who was born blind may deduce things about colors). So for such people it is necessary for the argument to be about [mere] names, [by which] to understand nothing.[151]

It seems to some people that the nature and substance of each of the beings that are by nature is the first component present in it, which is intrinsically unshaped—for example, the wood is the nature of the bed, and the bronze of the statue.[152] It is a sign of this, Antiphon says, that if someone were to bury a bed, and the decomposing material were to acquire the capacity to send up a shoot, what came up would not be a bed but wood—his supposition being that the disposition of the material that is in accord with convention and craft knowledge belong coincidentally to the wood, whereas the substance is what remains continuously while these things happen to it. And if each of these materials is also related to another in the same way (for example, bronze and gold to water, bones and wood to earth, and similarly too with anything else whatsoever), then *that* would be their nature and substance.

That is why some people say that fire is the nature of the beings, some that earth, air, or water is, and others that all of them, others that some of them, are. For whatever any of these people took to be of this sort—whether it was one or more than one—this or these he declared to be the substance of all things, everything else being attributes, states, or dispositions of these, and declared this or these to be eternal, since they do not change from themselves, whereas other things come to be or pass away an unlimited number of times.

In one way, then, something is said to be nature when it is the first underlying matter for each of the things that have within themselves a starting-point of movement and change.

In another way, though, what is said to be nature is the shape—that is, the form—that is in accord with the account. For just as something is said to be [a work of] craft when it is in accord with craft knowledge and produced by craft, so something is said to be [a work of] nature when it is in accord with nature and produced by nature. And as in the one case we would not yet say that a thing is at all in accord with craft if it were only potentially a bed and had not yet the form of a bed, or that it is [a work of] craft, so it is in the case of things composed by nature. For what is only potentially flesh or bone, before it acquires the form that is in accord with the account by which we define flesh or bone and say what it is, neither has yet its own nature nor is it by nature. So in this other way the nature is the shape—that is, the form—of things that have within themselves a starting-point of movement, something that is not separable except in account.[153] (What is composed of both [form and matter], though, is not nature, but by nature—for example, human being.)

In fact, the form is more nature than the matter is. For each thing is said to be when it actually is more than when it potentially is.

Further, human comes to be from human, but not bed from bed. That in fact is why some people say that the shape is not the nature but the wood, because if it were to send up a shoot, it would not be a bed that comes up but wood. But if this is therefore craft, the shape too is nature: human does indeed come to be from human.[154]

Further, when we speak of nature as coming to be, it is as a route to nature [as possessed].[155] For it is not said of things in the way medical treatment is, which is a route not to the craft of medicine but to health. For medical treatment must proceed from the craft of medicine and not to it. But it is not in this way that nature (*phusis*) [as coming to be] is related to nature [as possessed], rather what is naturally growing (*to phuomenon*), insofar as it is naturally growing, proceeds from something to something. What is it, then, that is growing? Not the thing it is growing from, but the one it is growing into. The shape, therefore, is nature.

But something is said to be shape or nature in two ways, since the lack too is in a way form. Whether or not there is a lack and a contrary involved in unconditional coming to be, however, we must investigate later.[156]

II 2

Since we have distinguished the number of ways in which things are said to be nature, the next thing is to get a theoretical grasp on how the mathematician differs from the natural scientist (for natural bodies too have planes, solids, lines, and points, which are the things the mathematician investigates). Further, on whether astronomy is distinct from natural science or a part of it. For if it belongs to the natural scientist to know what the sun or the moon is, for him not to know their intrinsic coincidents would be absurd—especially since it is evident that those who speak about nature discuss the shapes of the sun and the moon, and in particular whether the earth and the cosmos are spherical or not.[157]

Now the mathematician too busies himself about these things, although not insofar as each of them is the limit of a natural body, nor does he get a theoretical grasp on the coincidents of natural bodies insofar as they are such. That is why he separates them. For they are separable in the understanding from movement, and so their being separated makes no difference, nor does any falsehood result from it.

Those who speak about the Ideas do this too, though it escapes their notice.[158] For they separate natural objects though these are less separable than mathematical ones. This would become clear if one were to try to state the definitions both of the objects themselves and their coincidents. For odd and even, straight and curved, and furthermore number, line, and figure will be without movement, whereas flesh, bone, and human will not, but rather all of them are said of things just as snub nose is and not as curved is.[159] This is also clear from the more natural-science-like parts of mathematics, such as optics, harmonics, and astronomy. For these are in a way the reverse of geometry. For whereas geometry investigates natural lines, but not insofar as they are natural, optics investigates mathematical lines, but not insofar as they are mathematical.

But since nature is twofold, form and also matter, we should get a theoretical grasp on it as if we were investigating what snubness is, so that we should get a theoretical grasp on natural things neither without their matter nor with regard to their matter [alone]. For of course there might be a puzzle about this, since there are two natures, as to which is the concern of the natural scientist. Or is he concerned with the combination of the two? But if with the combination of the two, he is also concerned with each of them. Does it belong to the same science, then, or to distinct ones, to know each of them?

If we look to the ancient thinkers, natural science would seem to be concerned with matter [alone] (for it was only very slightly that Empedocles and Democritus touched on form and essence).[160]

If, on the other hand, craft imitates nature, and if it belongs to the same science to know the form and, up to a point, the matter (for example, it belongs to the doctor to know health, and also bile and phlegm, in which health resides, and to the builder to know the form of a house, and also the matter, that it is bricks and beams, and similarly in the case of the others), then it belongs to the natural scientist to know both natures.

Further, knowledge of the for-the-sake-of-which—that is, the end—belongs to the same science as knowledge of the things that are for its sake.[161] But nature is an end and a for-the-sake-of-which (for whenever a continuous movement has a certain end of its movement, this is a last thing and the for-the-sake-of-which).[162] (That is why the poet spoke ridiculously when he said, “he has reached the end for which he was born,” since by “end” we mean not every last thing, but the best one.)[163] For the crafts produce their matter, some unconditionally, while others make it good relative to the function.[164] And we make use of all things as if they were there for us, since we also are in a way an end.[165] For the end is twofold, as we said in *On Philosophy*.[166]

There are two crafts, though, that rule over the matter and have knowledge of it, the craft concerned with the use and the architectonic one concerned with production.[167] That is why the one concerned with the use is in a way architectonic, but it differs from the other insofar as it knows the form, although the architectonic one as productive knows the matter.[168] For the captain knows what sort of form the rudder should have and prescribes its production, whereas the other knows what sort of wood it should be made from and by what movements it will be made. In the case of the products of craft, then, we produce the matter for the sake of the function, whereas with natural things the matter is already present.[169]

Further, matter is relative to something, since there is one [sort of] matter for one form, and another for another.[170]

Up to what point, then, must the natural scientist know the form and the what-it-is? Or just as the doctor knows sinews and the blacksmith bronze, is it in fact up to the point of knowing what each of them is for the sake of, and knowing about the ones that, though separable in form, are in matter?[171] For human is begotten by human and sun.[172] But the way the separable is, and what it is, is the function of primary philosophy to determine.[173]

II 3

Having determined these things, we should investigate how many and what sorts of causes there are. For since our work is undertaken for the sake of knowledge, and we do not think we have knowledge of each thing until we have grasped the why of it, which is to grasp its primary cause, it is clear that we must do this in the case of coming to be, passing away, and every sort of natural change, so that by knowing the starting-points of these we may try to refer back to each thing we are inquiring about to them.

Something is said to be a cause if it is:[174] [1] The component from which a thing comes to be—for example, the bronze of a statue or the silver of a bowl, and also the kinds (*genos*) of these.[175] [2] The form or paradigm, that is, the account (*logos*) of the essence, and kinds (*genos*) of this (for example, of the octave, the ratio (*logos*) 2:1 and number in general), and the parts included in the account. [3] Further, that from which the change or rest from change first starts—for example, the person who has deliberated is cause [of the action] and the father of his child and in general the producer is cause of the thing being produced and the change-maker of what is changed being changed. [4] Further, the end, and this is the for-the-sake-of-which—for example, of taking walks health is the end. For why does he take walks? "In order that he may be healthy," we say. And in speaking that way we think we have presented the cause. Also, anything, then, that comes to be as an intermediate means to the end, when something else has started the movement—for example, in the case of health, making thin, purging, drugs, or instruments, since all these are for the sake of the end, although they differ from each other in that some are instruments and others works.[176]

These, then, are pretty much all the ways in which things are said to be causes, and because they are said to be such in many ways it follows both [a] that there are many causes of the same thing, and not coincidentally (as, for example, a statue has both the craft of sculpture and the bronze as causes—not in accord with its being another thing but insofar as it is a statue—although not in the same way, but the one as matter and the other as that from which the movement derives), and [b] that things can be causes of each other (as, for example, exercise [is a cause] of good physical condition and the latter of exercise, although not in the same way, but the one as end and the other as the starting-point of movement).[177] Further, the same thing can be the cause of contraries, since the thing that, when present, is cause of so-and-so, we sometimes hold causally responsible, when absent, for the contrary result—for example, the cause of a shipwreck is the absence of the captain whose presence was a cause of its preservation.

All the causes now mentioned fall into four most evident ways [of being causes].[178] For phonetic elements are causes of syllables, matter of artifacts, fire, earth, and all such things of bodies, the parts of the whole, and the hypotheses of the conclusion, as being causes from which [the relevant things come].[179] And of these some are causes as underlying subject (for example, the parts), some as the essence (for example, the whole, the mode of composition, and the form).[180] And the seed, the doctor, the deliberator, and in general the producer are all starting-points from which comes change or rest. The remainder are causes as the end and the good of other things. For what other things are for the sake of tends to be the best and their end. Let us assume that it makes no difference whether we say "good" or "apparent good."[181]

These, then, are the causes and this is the number of their species, but the ways of being causes, though many in number, also come under comparatively few headings. For things are said to be causes in many ways, and those within the same species are said to be prior or posterior to each other—for example, [as a cause] of health, the doctor and the craftsman; of the octave, the double and number; and in every case whatever includes any of the particular causes.

Further, there are coincidental causes and their kinds (*genos*)—for example, [as a cause of] a statue, in one way Polyclitus, in another a sculptor, because the sculptor coincides with Polyclitus, and, as examples of what includes the coincidental cause, a human is a cause of the statue, or in general an animal (because Polyclitus is human and a human is an animal).[182] And among coincidental causes some are more remote than others, some less—for example, if the pale and the musical were said to be causes of the statue.[183]

Beyond all the things said to be causes either properly or coincidentally, however, some are said to be so potentially and others actively—for example, [as a cause of] the house's being built, a builder on the one hand and a builder building on the other.[184]

Similarly, the things that causes are causes of will also be said to be in the ways mentioned—for example, this statue, a statue, or in general a likeness, or this bronze, bronze, or in general matter; and similarly in the case of coincidental [effects].[185]

Further, both the proper and the coincidental may be said to be causes in combination—for example, not Polyclitus or sculptor but Polyclitus the sculptor.

But still all of these things are just six [i-vi] in number, each said to be in two ways [a-b]: either [a-i] as the particular, [a-ii] as the kind (*genos*), [a-iii] as the coincidental, or [a-iv] as the kind of the coincidental is, or as these are either [a-v] as combined or [a-vi] as taken simply, and [b] all of them either as actualities or potentially. But they differ to the extent that what is actual and what is particular exists, or does not exist, at the same time as the things it causes—for example, this person curing at the same time as this one recovering his health, this builder building with this building being built.[186] But this is not always the case with what are potentially causes, since the house does not pass away at the same time as the builder.

Here, as in the other cases, though, we must always seek the most precise cause of each thing.[187] For example, a human is building because he is a builder, and he is a builder in virtue of the craft of building. This latter, therefore, is the prior cause, and similarly in all cases.

Further, we must seek kinds (*genos*) of causes for kinds (*genos*) of things, and particular causes for particular things—for example, a sculptor is the cause of a statue, and this sculptor of this statue. And we must seek potential causes for potential effects, and actual causes for actual effects.

Let these determinations suffice, then, as to the number of causes and to the ways in which they are causes.

II 4

But luck and chance are also said to be causes, and many things are said to be and to come to be because of luck or because of chance.[188] We must investigate, then, in what way luck and chance are included among the causes, whether luck or chance are the same or distinct, and in general what luck is and what chance is.[189]

For some people raise a puzzle as to whether luck or chance even exist. For they say that in fact nothing comes to be by luck, but that everything that is said to come to be by luck or chance has some definite cause—for example, of someone's coming into the marketplace and by luck finding the person he wished but did not expect to meet, they say that the cause is his wishing to go shopping in the marketplace. And similarly in the case of other things that are said to come to be by luck, they say that it is always possible to find some thing—not luck—that is the cause. For if there were indeed such a thing as luck, it would appear truly strange and puzzling that none of the ancient wise men who talked about the causes of coming to be and passing away ever determined anything about luck. On the contrary, it seems that they also thought nothing is by luck. But this too is cause for surprise. For many things come about and are by luck and by chance, and, though people are not unaware that each of the things that come to be can be referred back to some [definite] cause (as the aforementioned argument that does away with luck says), nevertheless they all speak of some of these things as being by luck, others as not being by luck.[190] That too is why the early wise men should have mentioned luck in some way or other.

But then they did not think either that luck was among the causes they recognized—for example, love, strife, understanding, fire, or anything else of that sort. Either way, then, it is strange, whether they supposed that there was no such thing as luck, or that there was such a thing but neglected to discuss it. Especially when they sometimes make use of it, as Empedocles does when he says that air is not always separated out on top but as luck would have it. At any rate, he says in his cosmogony that “it happened to run in this way then, but often in another way.”[191] And he says that most of the parts of animal come to be by luck.[192]

Other people make chance the cause of this heaven and of all the cosmoses.[193] For they say that the rotation came to be by chance, as did the movement that separated things out and put in place the present order of the universe. And this itself merited yet more surprise. For on the one hand they say that animals and plants neither are nor come to be by luck, but that nature, understanding, or something else of that sort is the cause (since it is not just any random thing that comes to be from a given sort of seed, but an olive tree from one sort and a human being from another), whereas on the other hand they say that the heaven and the most divine of visible things came to be by chance, and have no cause of the sort that animals and plants have. And yet if such is the case, this very fact merits attention, and something might well have been said about it. For in addition to the other respects in which what they say is strange, it is even stranger to say it when they see nothing in the heaven coming to be by chance, whereas among the things that [in their view] are not by luck many do come to be by luck. And yet for the contrary to happen would surely have been likely.

There are others, though, who believe that luck is indeed a cause, but that it is unclear to human thought, as being a divine thing and very mysterious.[194] So we must investigate what chance is and what luck is, whether they are the same or distinct, and how they fit into the causes we have distinguished.[195]

II 5

In the first place, then, since we see that some things always come to be in the same way, and others do so for the most part, it is evident that luck or what is by luck is not the cause of either of these—either of what is by necessity and always or of what is for the most part.[196] But since there are other things beyond these that come to be, which everyone says come to be by luck, it is evident that there is such a thing as luck and as chance. For we know that things of this third sort are by luck and that things that are by luck are things of this sort.

Of things that come to be, some do so for the sake of something, whereas others do not. And of the former, some are in accord with deliberate choice, whereas others are not in accord with deliberate choice, although both are among the things that are for the sake of something.[197] So it is clear that among the things that are neither necessary nor for the most part there are some that admit of being for the sake of something. The ones that are for the sake of something, though, are ones that might come to be as a result of thought or of nature. Whenever, then, something like this comes to be coincidentally, we say that it does so by luck. For just as being is either intrinsic or coincidental, in the same ways it is possible to be a cause—for example, the intrinsic cause of a house is the builder, but coincidentally it is the pale or the musical. The intrinsic cause is definite, whereas the coincidental one is indefinite, since an unlimited number of things may coincide in one thing.

As has been said, then, whenever a coincidental cause occurs among things that come to be for the sake of something, then they are said to be by chance or luck.[198] (The difference between the two will be determined later.[199] But for now let us take as evident that both are found among things that are for the sake of something.)

For example: The man would have come for the sake of getting back his money when a debtor was collecting contributions for a feast, if he had known about it. But in fact he did not come for the sake of this. On the contrary, it was a coincidence that he came, and did so for the sake of getting back his money—this provided that he neither for the most part nor of necessity went.[200] The end, however, namely, getting back his money, although it is not one of the causes present in him, is among the things that can be deliberately chosen and are a result of thought. And in *this* case he is then said to have come there by luck. But if he had deliberately chosen, and for the sake of getting back his money, either always or for the most part to come to the place, then it was not by luck that he did so.

It is clear, therefore, that luck is a coincidental cause that is found among those of the things that are for the sake of something that are in accord with deliberate choice. That is why thought and luck are concerned with the same things, for deliberate choice does not occur without thought.[201]

The cause of things that might come to be by luck are of necessity indefinite. That is why luck too seems to be something indefinite and unclear to human beings, and why it might seem that in a way nothing comes to be by luck. For all these things are said quite correctly, that is, reasonably. For things do in a way come to be by luck, since they come to be coincidentally, and luck is a coincidental cause. Unconditionally, though, luck is not the cause of anything. For example, although a builder is cause of a house, coincidentally a flute player is. And of the man's coming and getting back his money, though he did not come for the sake of this, the coincidental causes are unlimited in number, since in fact he might have come because he wished to see someone, to be an accuser or defendant in court, or to go to the theater.

Also, it is correct to say that luck is something beyond reason. For a reason is what always is or for what for the most part is, and luck is found in what is beyond these. And so, since the causes in such cases are indefinite, luck too is indefinite.

Nevertheless, in some cases one might raise a puzzle as to whether any random thing might be a cause of what is [by] luck—for example, of health, the wind, or the heat of the sun, but not having had a haircut. For some coincidental causes are more relevant than others.

Luck is said to be good when something good results, bad when something bad results, and is called good fortune or bad fortune when the results are of some magnitude. That is why someone who comes within an inch of a great evil or a great good is said to be fortunate or misfortunate, because thought speaks as if the thing were already had, since an inch seems no distance at all.

Further, it is reasonable that good fortune is unstable, since luck is unstable. For nothing that is by luck is either always or for the most part the case.

Both, then—both luck and chance—are causes, as was said, coincidentally, that are found among things that admit of coming to be neither unconditionally nor for the most part, and, of these, among the ones that happen for the sake of something.[202]

II 6

They differ in that chance extends more widely. For everything that is by luck is by chance, but not everything that is by chance is by luck. For luck and what is by luck belong to whatever good fortune and, in general, action also belong.[203] That is why luck is of necessity concerned with what is doable in action. A sign of this is that good fortune seems to be the same as happiness or close to it, and happiness is a sort of action, since it is doing well in action.[204] So whatever cannot do an action cannot do anything by luck either.

And it is because of this that nothing done by an inanimate object, wild beast, or child is done by luck—because they do not have deliberate choice.[205] Nor do good fortune or misfortune belong to them, except in virtue of some similarity—as Protarchus said that the stones from which altars are made are fortunate, because they are esteemed, while their fellows are trodden underfoot.[206] Nevertheless, even these things are affected by luck in a way, when someone doing some action concerning them does so by luck, but otherwise they are not.

Chance on the other hand is found both in the other animals and in many inanimate objects—for example, the horse came by chance, we say, in that it was saved because it came, but did not come in order to be saved. And that the tripod fell [on its feet] is a case of chance, since, though it stood that way for the sake of being sat on, it did not fall for the sake of being sat on.

So it is evident that among things that [1] unconditionally come to be for the sake of something, whenever [2] those that come to be do not do so for the sake of what actually results, [3] the cause being external, we say that they come to be by chance. And we say that the ones that come to be by luck are the ones among those that come to be by chance that can be deliberately chosen by those capable of deliberate choice.

A sign of this is the expression "pointless," because it is said of something when what it is for the sake of does not come to be, but [only] what was for that thing's sake.[207] For example, suppose walking is for the sake of loosening the bowels, if this did not come about when someone has walked, we say that the person walked pointlessly and that his walking was pointless. The supposition being that this is what is pointless, what is naturally for the sake of something else, when it does not accomplish what it was—and is by nature—for the sake of. For if someone said that his washing himself was pointless because the sun was not eclipsed, he would be ridiculous, since the one was not done for the sake of the other. So it is chance, then, as even its name (*automaton*) suggests, when a thing (*auto*) comes to be pointlessly (*matên*). In fact the stone that fell did not do so for the sake of hitting the man; it was by chance, therefore, that the stone fell, because it might have fallen due to someone and for the sake of hitting the man.

The separation of chance from luck is greatest in things that come to be by nature. For if something comes to be contrary to nature, we say that it came to be not by luck but by chance.[208] But even this is distinct from chance, since the cause of the latter is external, that of the former internal.[209]

What chance is and what luck is, and in what respect they differ from each other, has now been stated. And as for the way in which they are causes, each of them is a starting-point from which movement originates. For each is always a cause of what is either by nature or a result of thought, although their number is indefinite.

But since chance and luck are causes of things of which either understanding or nature might have been the cause, whenever something comes to be a coincidental cause of these same things, and as nothing coincidental is prior to what is intrinsic, it is clear that neither is the coincidental cause prior to the intrinsic one. Accordingly, chance and luck are posterior to understanding and nature. And so however true it may be that chance is the cause of the heaven, understanding and nature must be prior causes both of many other things and of this universe.[210]

II 7

It is clear, then, that there are causes and that they are as many in number as we stated.[211] For the why of things encompasses that many. For we refer at last back to [1] the what-it-is, in the case of immovable things (for example, in mathematics, since there we refer back at last to the definition of straight, commensurable, or something else); or to [2] the first cause of movement (for example, why did they go to war?—because they were raided); or to [3] what it is for the sake of (for example, in order that they may rule); or, in the case of things that come to be, to [4] the matter.[212] It is evident, then, that these are the causes and this is how many they are.

Since, though, there are four of them, the natural scientist should know them all, and to give the why in a natural scientific way must refer it back to all of them—the matter, the form, the cause of movement, the for-the-sake-of-which. But the last three often amount to one, since the what-it-is and the for-the-sake-of-which are one, and the first source of the movement is the same in form as these (for human begets human), and so it is in general in the case of things that cause movement by being in movement.[213]

Those that cause movement without being in movement, by contrast, are no longer part of natural science. For they have no movement or starting-point of movement within themselves, but are immovable. That is why there are three sorts of [scientific] works, one concerned with immovable things, one concerned with movable ones that are incapable of passing away, and one concerned with things that are capable of passing away.[214]

So the why is given by referring back to the matter, the what-it-is, and the first cause of the movement.[215] For where coming to be is concerned causes are investigated most of all in this last way: by asking, what comes to be after what, what first affected or was affected, and in this way always going on to the next one in the series.

The starting-points of natural movement, though, are twofold. One of these is not natural, since it does not have a starting-point of movement within itself. **198b1** Anything is of this sort if it causes movement without being itself in movement, just as what is entirely immovable (that is, the first of all beings) does and also the what-it-is (that is the shape), since it is the end and the for-the-sake-of-which. And so, since nature is for the sake of something, and this cause must be known, the why is given in all ways.[216] For example: [1] from this that will necessarily result (whether from it unconditionally or for the most part); [2] if this is going to be [then that must first be so] (as from the premises the conclusion results); [3] this is the essence; [4] because it is better this way—not unconditionally better, but better in relation to the substance of the given thing.[217]

II 8

We must first state, then, why nature is among the causes that are for the sake of something, and then what way necessity is present in natural things.[218] For everyone refers things back to this latter cause, stating that since the hot, the cold, and accordingly each thing of this sort is by nature such-and-such, certain other things of necessity are and come to be. For if they mention any other cause, they just touch upon it, and let it go at that—one mentioning love and strife, another the [divine] understanding.[219]

There is thus a puzzle as to what prevents nature from acting not for the sake of something or because it is better, but as Zeus rains down rain—not in order that the corn may grow, but of necessity.[220] (For what has been drawn up must become cold, and what has become cold, having become water, must come down. But for the corn to grow when this happens is coincidental.) Similarly too if someone's corn on the threshing floor perishes, it does not rain for the sake of this, that the corn may perish, but rather this is coincidental. So what is to prevent parts in nature too from being the same way (the front teeth, for example, of necessity growing out sharp and suitable for tearing apart, the back ones broad and useful for grinding up food), inasmuch as they do not come to be for the sake of the given thing, but rather it was coincidental—and similarly with the other parts that seem to be for the sake of something? Wherever, then, all the parts came to be just as if they had come to be for the sake of something, then the things [whose parts they were] survived, as a result—albeit by chance—of being suitably composed, whereas those that were not like that, such as the man-headed ox-progeny mentioned by Empedocles, perished and continue to perish [when produced].[221]

This is the argument, then, and any others that may be like it, that might raise a puzzle. But it is impossible for things to be like this. For these things we mentioned and all things that are by nature come to be as they do either always or for the most part, but none of the things that are by luck or chance does so. For it does not seem **199a1** to be by luck or by coincidence that it rains often in winter, but if it does so in the dog days of summer; nor that there are heatwaves in the dog days, but if there are in the winter.[222] If, then, things seem to be either by coincidence or for the sake of something, and if these ones are neither by coincidence nor by chance, then they would be for the sake of something. But surely all such things are by nature, as even those who state the foregoing argument would say. The for-the-sake-of-which, then, is present in things that come to be and are by nature.

Further, in whatever has an end, the earlier things, and the ones following them in order, are in action done for its sake. Well then, as things are done in action, so they are in nature, and as they are in nature, so each of them is done in action, provided there is no impediment.[223] In action, though, things are done for the sake of something. Therefore, in nature too they are for the sake of something. For example, if a house were one of the things that came to be by nature, it would do so just as it now does by craft. And if things came to be not only by nature but also by craft, they would come to be just as they do by nature. One thing, therefore, is for the sake of another. In general, though, craft in some cases completes the things that nature is incapable of bringing to completion, while in others it imitates nature. If, then, what is in accord with craft is for the sake of something, it is clear that what is in accord with nature is as well. For in what is in accord with craft and in what is in accord with nature the relation of what comes after to what comes before is the same.

This is most evident in the case of the other animals, since they do not make things either by craft, by carrying out inquiries, or by engaging in deliberations—which is why some people are puzzled as to whether spiders, ants, and things of that sort do what they do by means of understanding or in some other way. And if we proceed a little further in this way, it is evident that even in plants things come to be that further the end—for example, leaves for the sake of shading the fruit. If, then, it is both by nature and for the sake of something that the swallow makes its nest and the spider its web, and if plants grow leaves for the sake of the fruit, and send roots down rather than up for the sake of food, it is evident that this sort of cause is present in things that come to be and are by nature.[224] And since nature is twofold, the one as matter and the other as shape, and since the latter is the end, and the other things are for the sake of the end, the cause in the sense of the for-the-sake-of-which must be the shape.

Error, however, occurs even in what is in accord with craft (for grammarians have written incorrectly and doctors given the wrong medicine), so it is clear that it is also possible in what is in accord with nature. If, then, it sometimes happens in things that are in accord with craft that the for-the-sake-of-which is correct, and that in cases of error what is attempted is for the sake of something but fails to hit it, the same must also be so in the case of natural things, and monsters must be errors of that sort in what they are for the sake of.[225] Among the things composed at the start as well, therefore, the [man-headed] ox-progeny, if they were unable to reach a certain defining mark and end, must have come to be as a result of some defective starting-point, in just the way that as things stand they do so from defective seed.[226]

Further, seed must come to be first, and not the animal straight off, and the "undifferentiated first" was a seed.[227]

Further, the for-the-sake-of-which is also present in plants, though in a less articulated way. Among plants too, then, did olive-headed vine sprouts come to be, just as man-faced ox-progeny did, or didn't they? For that would be absurd. But surely they would have to have, if indeed they also did so among the animals.

Further, among seeds too coming to be would have to be a matter of luck [on this view]. But the person who says this does away entirely with nature as well as what is by nature. For things are by nature when, from some starting-point within themselves, they arrive by a continuous movement at a certain end—from a given starting-point, though, the same thing is not reached in each case, nor is some random one, yet [the movement] is always to the same thing, provided there is no impediment.

The for-the-sake-of-which, and what is for *its* sake, might come to be by luck. We say, for example, that a guest-friend came by luck, paid the ransom, and then went away, when he did the action as if he had come for the sake of doing it, though it was not for the sake of doing it that he came.[228] And so this is coincidental (for luck is one of the coincidental causes, as we said previously).[229] But when something comes to be always or for the most part, it does not do so coincidentally or by luck, but in what is natural it always does so in this way, provided there is no impediment.

It is strange to think that nothing comes to be for the sake of something if the cause of the movement is not seen deliberating. For even craft does not deliberate.[230] And if the craft of shipbuilding were present in the wood, it would produce in the same way by nature. So if the for-the-sake-of-which is present in craft, it is also present in nature. This is clearest when a doctor cures himself, since nature is like this.

It is evident, then, that nature is a cause, namely, a cause in the way that the for-the-sake-of-which is.

II 9

As for what is by necessity [in natural things], we must ask whether it is hypothetical, or also unconditional. For as things stand it is thought that what is by necessity is found in what comes to be in the way in which someone might suppose that the wall of a house came to be by necessity, because heavy things by nature spatially move downward, and light ones upward. And so the stones and the foundations are down below, the clay is up above them because it is lighter, and the wooden logs are on the very top, since they are the lightest. Nevertheless, though the wall does not come to be without these, it did not in fact come to be because of them, except as matter, but rather for the sake of shelter and protection.

Similarly too in the case of all the other things in which the for-the-sake-of is present: although they could not come to be without things that have a necessary nature, they do not in fact come to be because of these, except as matter, but rather for the sake of something. For example, why is a saw such as it is? So that *this* may be, and for the sake of *this*. But in fact it is impossible that this thing that the saw is for the sake of should come to be unless it is made of iron. It is necessary, therefore, for it to be made of iron, if there is to be a saw with its function. The necessity, then, is hypothetical, but not [necessary] as an end. For the necessity lies in the matter, whereas the for-the-sake-of-which lies in the account.

The necessity found in mathematics and in things that come to be in accord with nature are in a way quite similar. For since the straight is *this*, it is necessary that the angles of a triangle should equal two right angles, but not the other way around—even though if the latter does not hold, the straight will not be *this* either. In things that come to be for the sake of something it is the reverse: if the end is or will be, the previous things are or will be too, and just as in mathematics, where if the conclusion does not hold, the starting-point will not either, so here if the previous things are not or will not be, then neither will the end—that is, the for-the-sake-of-which. For the end is itself also a starting-point, although not of action but rather of rational calculation.[231] (In mathematics the starting-point is the starting-point of the rational calculation, since here no actions are involved.[232])

And so if there is to be a house, it is necessary for these things to come to be or to be present, and in general the matter that is for the sake of something—for example, bricks and stones if there is to be a house. Yet the end does not exist because of these, except as matter, nor will it exist because of them. In general, however, if they are not present there will be neither house nor saw (in the case of a house if the stones are not present, in the case of a saw if the iron is not), just as in mathematics the starting-points will not hold if the triangle does not have [its interior angles equal to] two right angles.

It is evident, then, that the necessity in natural things is what is called matter and the movements of the matter. And the natural scientist should state both causes, but most of all the for-the-sake-of-which. For this is the cause of the matter, not the matter of the end. And the end is the for-the-sake-of-which, and the starting-point is from the definition and the account, as in the things that are in accord with craft. For example, since a house is such-and-such sort of thing, these things must come to be or be present of necessity, or since health is *this*, these things must come to be or be present of necessity—and similarly if a human is *this*, these must be, and if these, these others. Presumably, though, necessity is also present in the account. For suppose the function of sawing is defined as such-and-such sort of division, well, it will not occur unless the saw has teeth of such-and-such a sort, and these cannot be of such-and-such a sort unless they are made of iron. For even in the account there are parts that stand as matter of the account.[233]

Book III

III 1

Since nature is a starting-point of movement and change, and our methodical inquiry is concerned with nature, we must not neglect to consider what movement is, since if we are ignorant of this, we must be ignorant of nature too. And once we have made determinations about movement we must try to inquire in the same way about the things that come next in order.

Now movement seems to be one of the things that are continuous, and the unlimited first comes to light in what is continuous. That is also why those who define the continuous often make use of the account of the unlimited as well, on the supposition that what is divisible without limit is continuous. In addition, it seems that without place, void, and time, it is impossible for there to be movement.

Clearly, then, both because of this and because these things are common to everything [in nature] and universal, we must first undertake to investigate each of them, since the theoretical knowledge of what is special is posterior to that of what is common.[234] And first off, as we said, we should investigate movement.

Some things, then, are actual only, others potential, others potential and actual, being either a this something, a quantity, a quality, or likewise one of the other categories of being.[235] Of what is relative, one sort is said of things with reference to excess and deficiency, another with reference to affecting and being affected, and in general with reference to what can move something and be moved by something.[236] For what can move something can move what can be moved by it, and what can be moved by something can be moved by what can move it.

There is no movement, though, beyond the things mentioned, since what changes always does so either with respect to substance, quantity, quality, or place, and we say there is nothing to take as common to these that is neither a this, nor a quantity, nor a quality, nor a place, nor any of the things in the other categories either.[237] So there is no movement or change of anything beyond the ones we mentioned, since no *being* exists beyond the ones we mentioned either.[238]

Each of these, though, belongs to everything in two ways—for example, the this (for in the one case it is shape, in the other its lack), with respect to quality (for in the one case it is white, in the other black), with respect to quantity (which in the one case is complete, in the other incomplete).[239] Similarly, with respect to spatial movement, which in the one case is upward, in the other downward—alternatively, in the one case [of] what is light, in the other [of] what is heavy.[240] So there are just as many kinds (*eidos*) of movement and change as there are of being.

Since there is a distinction with respect to each kind (*genos*) between actuality and potentiality, the actualization of what is potentially, insofar as it is such, is movement.[241] For example, the actualization of the alterable, insofar as it is alterable, is alteration; the actualization of what is capable of increasing and of its opposite, decreasing (for there is no name common to both) is increasing and decreasing; the actualization of what is capable of coming to be and passing away is coming to be and passing away; and the actualization of what is capable of spatial movement is spatial movement.[242] That this is movement is clear from the following: whenever what is buildable, insofar as it is what we say it is, is in actuality, it is being built, and this is building. And similarly with learning, curing, rolling, maturing, and aging.

Since, in some cases, the same things are both potential and actual, although not at the same time or with respect to the same thing, but instead, for example, are actually hot and potentially cold, already it follows that many things will both affect each other and be affected, since everything of this sort will be at once capable of affecting and being affected. And so what naturally causes movement will itself be movable, since everything of this sort that causes movement is itself moved. Some people even think that whatever causes movement is itself moved, but how things stand where this is concerned will become clear from other considerations (for there is one mover that is immovable).[243]

The actualization of what is potentially, when it is actually active, not insofar as it is itself but insofar as it is movable, is movement.[244] By "insofar as," I mean this: The bronze is indeed potentially a statue, but nonetheless it is not the actualization of the bronze insofar as it is bronze that is movement. For the being for bronze is not the same as the being for a certain potential, since if it were unconditionally the same in account, the actualization of the bronze, insofar as it is bronze, would be movement.[245] But it is not the same, as we said. (This is clear in the case of contraries. For to have the potential to be healthy and to have the potential to be sick are not the same, since if they were, to be sick and to be healthy would be the same. The underlying subject, though, whether it is healthy or diseased, whether it is moisture or blood, *is* one and the same.[246]) And since it is not the same, just as color and the visible are not the same either, it is evident that it is of the potential *insofar as it is potential* that the actuality is movement.

It is clear, then, that movement is this, and that it exists when the actuality itself does, and neither earlier nor later.[247] For each thing [of this sort] admits of sometimes being active, sometimes not—for example, the buildable insofar as it is buildable. And the activation of the buildable insofar as it is buildable is building. For the activity is either this—the building—or the house. But when the house exists it is no longer buildable: what is buildable is what is [for] *being built*. It is necessary, therefore, for building to be the activity, and building is a sort of movement. And the same account also applies in the case of the other movements.

III 2

It is also clear from what others say about movement that what we have stated is correct, and from the fact that it is not easy to define it otherwise. For we cannot put movement and change in some other kind (*genos*). This is clear if we investigate where some people put them. For some say that movement is otherness or inequality or not being.[248] But none of these—whether things that are other than something, or things that are unequal, or things that are not—is necessarily in movement, nor is change to these or from these, any more than to or from their opposites.

What causes people to posit movement as these is that it seems to be something indefinite, and the starting-points in one of the two columns of opposites, because they are lacks, are indefinite.[249] For none of them is either a this or a such-and-such sort or any of the rest of the categories. The cause of movement's seeming to be indefinite, though, is that it cannot be posited unconditionally either as a potentiality of beings or as an activation of them.[250] For neither the thing that is potentially of a certain quantity nor what is actively of a certain quantity is necessarily moved, and movement seems to be a sort of activity, but incomplete activity. The cause of this, though, is that the thing that is potentially, of which it is the activation, is incomplete. And because of this it is difficult to grasp what movement is, since it must be posited either as a lack or as a potentiality or as an activity that is unconditionally such. But evidently none of these is possible. And so the remaining option is that it must be the way we said, that it is a sort of activity, but the sort of activity we stated, which, though difficult to discern, can exist.[251]

Everything that moves things in the way we said is also moved, that is, every mover that is potentially movable and whose immobility is rest (for in the case of what movement belongs to, immobility is rest).[252] For to affect this sort of thing, insofar as it is of this sort, is just what it is to move it. But this it does by contact, so it is at the same time affected.[253] That is why movement is the actualization of the movable insofar as it is movable, and this happens by contact with what is capable of moving it, so that the latter is also affected at the same time.[254] The mover, however, is always the bearer of some form, whether a this, or of this quality, or of this quantity, which will be the starting-point and cause of movement, whenever it moves something. For example, what is actually a human being makes, from what is potentially a human being, a human being.

III 3

Also evident, and a point that raises a puzzle, is that movement is in the thing moved, since movement is the actualization of the moveable by what can in fact move something.[255] And the activation of what is capable of moving something is no other than this. For there must be the actualization of both, since it *can move* something by having the potentiality to do so, and it *is moving* it by being active. But it is on the moveable that the mover is capable of acting, so that the activation of both alike is one, just like the interval from one to two and from two to one, or the hill up and the hill down. For these things are one, but their account is not one.[256] And similarly in the case of the mover and the moved.[257]

This does, though, involve a logico-linguistic puzzle.[258] [1] For presumably there must be some activation of what is capable of affecting and of what is capable of being affected, the first of which is an affecting, the second a being affected. And the function and end of the first is a thing done, whereas of the second it is a thing undergone.[259] [2] Since, then, both of these are movements, [3] if they are distinct, what are they in? For either [3a] they are both in what is affected and moved, or else [3b] the affecting is in what affects and the being affected is in what is affected (if this too must be called an affecting, then affecting will be homonymous).[260]

Moreover, if this [3b] is so, the movement will be in the mover (the same account will apply to the mover and to the thing moved), and so either every mover will be moved, or, while possessing movement, it will not be moved. If, on the other hand, [3a] both the affecting and the being affected are in what is moved and affected, and teaching and learning, which are two things, are in the learner, then first [3a-i] the activation of each will not be in each, and second [3a-ii], and absurdly, [the learner] will be moved by two movements at the same time. For what will be the two alterations of one thing to one form? But that is impossible. Instead, the activation of each will be one.

[4a] But [some will say] it is unreasonable for two things that are distinct in form to have one and the same activation. Also, [4b] if teaching and learning, and affecting and being affected, are the same, then to teach will be the same as to learn, and to affect will be the same as to be affected, so that it will be necessary for the one who is teaching to be in every case learning, and the one that is affecting to be in every case affected.

Or, is rather that: [Response to 3a-i] it is not absurd for the activation of one thing to be in another thing, since teaching is the activation of the one who can teach, but occurring in something, and not cut adrift, but of *this* occurring in *that*; [response to 4a] neither is there anything to prevent the activation of two things from being one and the same—not as the same in being, but in the way that what potentially is, is related to what actively is; [response to 4b] nor is it necessary for the one who is teaching to be learning, even if affecting and being affected are the same—provided they are not the same in such a way that one account states the essence of each (as with cape and cloak), but are so rather in the way that the road from Thebes to Athens is the same as the road from Athens to Thebes, as was said earlier.[261] For it is not the case that all the same attributes belong to things that are the same in any way whatsoever, but only to those whose being is the same. Not even if teaching is the same as learning, however, would it be the case that to teach is the same as to learn, just as, not even if two places separated by an interval have one interval between them would it be the case that being separated by the interval from here to there is one and the same as being separated by the interval from there to here. But, speaking in general terms, neither teaching and learning nor affecting and being affected are in the strict sense the same, though what they belong to is the same: the movement.[262] For being the activation of *this* occurring in *that* and being the activation of *that* by *this* are distinct in account.[263]

What movement is, then, has been stated, both universally and in particular cases. For it is quite clear how each of its kinds (*eidos*) will be defined—for alteration, for example, will be the activation of the alterable insofar as it is alterable. Or to make it still better known: it is the activation of what is capable of affecting or capable of being affected, insofar as it has that capacity, whether unconditionally or again in a particular case—for example, building or curing. And an account will be given in the same way where each of the other sorts of movement is concerned.

III 4

Since natural science is concerned with magnitudes, movement, and time, each of which must be either limited or unlimited, even if not everything is either limited or unlimited (for example, an affection or a point, since perhaps it is not necessary for any things of this sort to be either of these), it would be appropriate for the philosopher who works on nature to get a theoretical grasp on the unlimited, whether it exists or not, and if it exists, what it is.[264]

A sign that theoretical knowledge about the unlimited properly belongs to this science is that all those who are believed to have touched upon this sort of philosophy in a worthwhile way have produced an account of the unlimited, and all of them posit it as some sort of starting-point of the beings.

Some, such as the Pythagoreans and Plato, posit the unlimited not as a coincident of something else but as itself intrinsically a substance. The difference is that the Pythagoreans say that it exists among the perceptibles (since they do not make number separable), and that what is outside the heaven is unlimited.[265] Plato, by contrast, says that there is no body outside [the heaven], and that not even the Ideas are there, because they are not in any place, but that the unlimited is present both in the perceptibles and in the Ideas.

Also, the Pythagoreans identify the unlimited with the even. For this, they say, entrapped and limited by the odd, gives beings their unlimitedness. A sign of this, they think, is what happens with numbers. For when "gnomons" are arranged around the one and separate, the form is always a distinct one in the latter case, and the same in the former.[266] Plato, by contrast, has two unlimiteds, the great and the small.[267]

Those concerned with nature, on the other hand, all posit as subject for the unlimited, some other sort of nature, one of the so-called elements—for example, water, air, or what is intermediate between these.[268] Of those who make the elements limited [in number], however, none makes them unlimited [in quantity or extent], whereas those who make the elements unlimited [in number]—as Anaxagoras does from his homoeomeries, and Democritus from *his* universal seedbed of shapes—say that the unlimited is continuous by contact.[269]

Anaxagoras says that any part is a mixture in the same way as the All, because of seeing anything whatsoever coming to be from anything whatsoever. (It seems to be on the basis of that, indeed, that he also says that once upon a time all things were together—for example, *this* flesh and *this* bone, and likewise anything whatsoever, and therefore *all* things, and at the same time too.[270]) For there is a starting-point of the disaggregation not only in each thing, but also of all. For since what comes to be comes to be from a body of this sort; and since there is a coming to be of everything, although not at the same time; and since there must be some starting-point of the coming to be; and this starting-point is one, and of the sort that he calls [divine] understanding; and the understanding does its understanding and sets to work from some starting-point; it follows that all things were necessarily together at a certain time and started to be moved at a certain time.[271] Democritus by contrast says that none of the primary things comes to be from another. Nonetheless, the common body is for him a starting-point of all, differing from part to part in magnitude and shape.[272]

It is clear from these considerations, then, that theoretical knowledge [about the unlimited] is appropriate for natural scientists. It is quite reasonable too for them all to posit it as a starting-point. For they all think that it does not exist pointlessly and it cannot have any capacity except as a starting-point.[273] For everything is either a starting-point or from a starting-point. Of the unlimited, however, there is no starting-point, since, if there were, it would have a limit.[274] Further, it is incapable both of coming to be and of passing away, which suggests that it is a sort of starting-point. For what is coming to be must reach an end, and there is an end reached in every passing away. That is why, as we say, there is no starting-point of the unlimited, but it is rather the unlimited that seems to be a starting-point of the other things, and to encompass everything, and steer everything (as is said by those who do not posit other causes beyond the unlimited, such as understanding or love), and to be divine.[275] For it is immortal and indestructible, as Anaximander says, as do most of the physicists.

The conviction that something unlimited exists would seem to result mostly from investigating the following five things: [1] time (for it is unlimited); [2] the division of magnitudes (for mathematicians also make use of the unlimited); further [3] if coming to be and passing away do not run out, it is only because what things come to be from is unlimited; further [4] what is limited always reaches its limit in relation to something, so that there can be no [ultimate] limit, if one thing must always reach its limit in relation to another; and above all, and having most control on the outcome, is a point that produces

a puzzle common to all thinkers, namely, [5] because number, mathematical
magnitudes, and what is outside the heaven do not in fact
run out in thought, they all seem to be unlimited.[276] (And if what 25
is outside is unlimited, it seems that there is an unlimited body and
unlimitedly many cosmoses, since why should these be *here* rather
than *there* in a void?[277]) And so if indeed the body with volume is anywhere,
it is everywhere. At the same time, even if there is a void and
place is unlimited, there must also be an unlimited body, since in the
case of eternal things, there is no difference between being possible
and being. 30

Theoretical knowledge of the unlimited, though, does give rise to a
puzzle. For if we posit that it does not exist, many impossibilities result,
as they do if we posit that it does exist. Further, [if it exists], in which of
these two ways does it exist—as a substance or as some nature's intrinsic
coincident? Or does it exist in neither of these, yet nonetheless there
is an unlimited, or things that are unlimited in number?

What above all belongs to the natural scientist, however, is to investigate
whether there is a perceptible magnitude that is unlimited. The 204a1
first thing, then, is to determine in how many ways things are said to
be unlimited. We say so in one way, clearly, when the thing cannot be
traversed because it is not in its nature to be traversed (in just the way
the voice is invisible); in another, when it admits only of unending traverse,
or scarcely admits of it, or what—though by its nature it admits 5
of traverse or limit—is not traversed or limited.[278] Further, something
may be unlimited with respect to addition, with respect to division,
or both.

III 5

Now for the unlimited to be separable from the perceptibles, being
itself something unlimited, is not possible.[279] For if the unlimited is
neither a magnitude nor a plurality, but is itself a substance and not
a coincident, it will be indivisible, since what is divisible is either a 10
magnitude or a plurality. But if it is indivisible, it will not be unlimited
except in the way in which voiced sound is invisible.[280] It is not what is
unlimited in this way, though, that is said to exist by those who assert
that the unlimited exists, or that we are inquiring into, but what is so
by being untraversable. But if the unlimited is a coincident, it cannot—
insofar as it is unlimited—be an element of beings, just as the invisible 15
is not an element of speech, even though voiced sound is invisible.[281]

Further, how is it possible for some unlimited-itself to exist, if
indeed number and magnitude, of which the unlimited is an attribute,

cannot?[282] For there is still less necessity [for this in the case of the unlimited] than in the case of number and magnitude.

It is evident too that it is not possible for the unlimited to exist as actively so, and as a substance and a starting-point. For any part whatsoever of it that might be taken will be unlimited, if it is capable of having parts (for the being for the unlimited and the unlimited-itself are the same, if indeed the unlimited is a substance and not predicated of an underlying subject), so that either it is indivisible or it is divisible into unlimiteds.[283] But for the same thing to be many unlimiteds is impossible. (Yet just as a part of air will be air, so too a part of the unlimited will be unlimited, if at any rate it is a substance and a starting-point). Therefore, the unlimited must be incapable of having parts and indivisible. But this is impossible for what is a being in actuality, since it must be a certain quantity. The unlimited, therefore, belongs as a coincident. If that is so, however, it has been stated that it is not possible to call it a starting-point, but rather what it is a coincident of: air or the even.[284] So the view of those who say what the Pythagoreans say is absurd. For they posit the unlimited both as substance and as divisible into parts.

But presumably this inquiry would be universal: whether it is possible for there to be an unlimited present also in mathematical objects as well and in intelligible ones that have no magnitude.[285] Our investigation, by contrast, concerns perceptibles and topics our methodical inquiry is concerned with: whether there is or is not present in *them* a body that is unlimited in increase.

Now if we investigate the issue logico-linguistically, it would seem from the following considerations that no such body can exist.[286] For if the account of body is what is bounded by planes, there cannot be any unlimited body, whether perceptible or intelligible (nor can there be a number considered as separate and unlimited, since a number or what has a number is numerable, and so, if the numerable can be enumerated, it would also be possible to traverse the unlimited). If, on the other hand, we get a theoretical grasp on the issue in a more natural scientific way, [the conclusion is further supported] by the following ones. An unlimited body cannot be either [1] composite or [2] simple [and yet must be one or the other].

[1] It will not be composite, if the elements are limited in number. For there must be more than one element, and the contrary element must always be equal, and [1a] no one of them can be unlimited. For however much one contrary in one body falls short in capacity of another in another (for example, suppose fire is limited and air is unlimited, and the capacity of a quantity of air is any multiple

whatsoever of that of an equal quantity of fire, with the sole proviso that the multiple is some [finite] number), nonetheless it is evident that the unlimited body will overpower and destroy the limited one. But [1b] that each element should be unlimited is impossible. For a body is what has extension in all dimensions, and what is unlimited is what has unlimited extension, so that an unlimited body will be unlimitedly extended in all dimensions.

[2] But then neither is it possible for an unlimited body to be one and simple, whether it exists, as some thinkers say, [2a] beyond the elements, and is what they generate these from, or [2b] simply exists.[287]

[2a] For there are some who make this [body] unlimited, and not air or water, in order that the others may not be destroyed by the unlimited one among them, since the elements have a contrariety with each other (for example, air is cold, water wet, fire hot), so if one of them were unlimited, the others would already have been destroyed.[288] But as things stand, they say, there is a distinct thing, from which these come to be. It is impossible, however, for there to be such a thing, not because it is unlimited (for about this topic there is a common statement to be made that applies to all things alike, whether air, water, or anything whatsoever), but because there is no body of this sort perceptible beyond the so-called elements.[289] For all things are dissolved into what they come to be from, so that the body in question would have to be here, alongside air, fire, earth, and water. But no such thing is observed.

[2b-i] Nor, of course, can fire or any other of the elements be unlimited. For in general, and separate from the question of whether any of the elements can be unlimited, it is impossible for the universe, even if it is limited, to be or come to be one of them, as Heraclitus says that at some time all things become fire.[290] The same argument applies to the one that the physicists put beyond the elements, since everything changes from contrary to contrary—for example, from hot to cold.[291]

The general question, though, of whether it is possible or impossible for there to be an unlimited perceptible body must be investigated on the basis of the following considerations.[292]

That it is in general impossible, then, for there to be an unlimited perceptible body is clear from the following. It is natural indeed for everything that is perceptible to be somewhere, and there is a certain place for each, and the same place for a part of it and for the whole—for example, for the totality of earth and for a single clod, and for fire and a spark.[293] So [2b-ii] if the unlimited perceptible body is uniform, it will be immovable or will always be moving.[294] And yet this is impossible. For why down rather than up or than anywhere else? I mean, for example, if there is a clod of earth, where will this move or be at rest? For the place of the body that is homogeneous with it is unlimited. Will the clod occupy the whole place, then? And, how? What then of its rest or movement? Will it be at rest everywhere? In which case it cannot move. Or be moving everywhere? In which case it cannot rest.

[2b-iii] On the other hand, if the universe has dissimilar parts, their places will also be dissimilar, and, firstly, the body of the universe will not be one except by contact, and, secondly, the parts will be either limited or unlimited in kind (*eidos*).[295] But limited they cannot be, since then those of one kind will be unlimited and those of another will not (if the universe is unlimited)—for example, fire or water will be unlimited, but something like that will be destructive of its contraries.[296] But if the parts are unlimited and simple, their places are also unlimited, and there will be an unlimited number of elements. But if this is impossible and the places are limited, the universe must be limited too.[297] (For it is impossible that place and body should not evenly match, since neither is place as a whole larger than the body can be (at the same time the body would no longer be unlimited), nor is the body larger than the place, since otherwise either a void will exist or a body for which it is natural to be in no place whatsoever). And it was because of this that none of the physicists made fire or earth the one unlimited body, but either water or air or what is intermediate between them, because each of the former clearly has a definite place, whereas the others play a double game between up and down.[298]

Anaxagoras for his part speaks in an out-of-place way about the unlimited being at rest.[299] For he says that the unlimited holds itself fixed, and that this is because it is within itself, since nothing else encompasses it, on the supposition that wherever anything is, it is there by its own nature. But this is not true, because a thing may be somewhere by force and not where it naturally is. So, however true it may be that the whole universe is not moved (for what holds itself fixed and is within itself must be immovable), it is still necessary to say why it is not in its nature to be moved. For it is not enough to make this statement and leave it at that. For anything else could be not moving, although nothing in its nature prevents it from doing so.[300] After all, the earth does not move either, and would not do so even if it were unlimited, provided it were still shut in by the center, but would remain at rest at the center, not because there is nowhere it will be moved to, but because it is in its nature to do so.[301] Yet one might say that it holds itself fixed. If, then, this is not the cause, even in the case of the earth, if it were unlimited, but the cause is that it has heaviness, and what has heaviness remains at rest at the center, and the earth is at the center, likewise too the unlimited could remain at rest within itself due to some other cause, and not because it is unlimited and holds itself fixed.

At the same time, it is clear that any part whatsoever of the unlimited would have to remain at rest. For, just as the unlimited remains at rest within itself, holding itself fixed, in the same way any part you take will remain at rest within itself. For the places of the whole and of the part are uniform—for example, of the whole earth and of a clod, it is below, and of the totality of fire and a spark, it is above. So, if the place of the unlimited is to be within itself, the place of a part will be the same. Therefore, it will remain at rest within itself.

In general, though, it is evident that it is impossible to say at the same time that there is an unlimited body and that there is some [proper] place for bodies, if every perceptible body has either heaviness or lightness, and, if it is heavy, has a spatial movement that is by nature toward the center, and, if it is light, upward. For this must be true of the unlimited as well. But it is impossible for all of it to have either of these attributes or for a half to have one and a half the other. For how will you divide it? And how, of what is unlimited, can there be an above and a below, or an extreme and a center?

Further, every perceptible body is in a place, and the species (*eidos*) and differentia (*diaphora*) of place are up and down, before and behind, and right and left. And these are not merely relative to us or to position, but are also distinguished within the whole universe itself.[302] But these cannot exist in the unlimited.[303] Simply put, if there cannot be an unlimited place, and every body is in a place, there cannot be an unlimited body. Moreover, what is somewhere is in some place, and what is in a place is somewhere. If, then, the unlimited cannot even be a quantity, for, if it were, it would have to be some particular quantity, such as two or three cubits, since it is these that "quantity" signifies, in the same way "in a place" signifies that a thing is somewhere, and this would be up, down, or in some other of the six directions, and each of these there is a certain limit.[304]

It is evident from these considerations, then, that there is no actively unlimited body.

III 6

But if nothing is unconditionally unlimited, it is clear that many impossibilities result. For there will be a start and an end of time, magnitudes will not [always] be divisible into magnitudes, and number will not be unlimited.[305] Now when the alternatives have been thus determined, and it seems that neither is possible, there is need of an arbitrator, and it is clear that in one way there is something unlimited and in another way there is not.[306]

Things, as we know, are said *to be* either potentially or actually, and what is unlimited is so on the one hand by addition and is so on the other by division. It has been stated, however, that a magnitude is not actually unlimited, although by division it is unlimited.[307] (For it is not difficult to refute indivisible lines.[308]) So it remains for what is unlimited to be so potentially. But we must not take the "potentially" here in this way that if this is potentially a statue, it will also *be* a statue, and suppose that there will be something actively unlimited.

Since, though, things are said to be in many ways, just as the day exists, and the games exist, because one thing is always coming to be after another, so it is too with the unlimited.[309] (For in the former cases as well there is a potentially and an actively. For the Olympic games exist both in the sense of the competition's potentially occurring and of its actively occurring.) It is clear, however, that the unlimited exists in distinct ways in the case of time, in the case of humans, and in the case of the division of magnitudes.[310] For in general the unlimited exists in the following way: in virtue of one thing always being taken after another, and each thing taken is always limited, but is always *one thing followed by another.*[311] —Again, though, things are said to be in many ways, so that we must not take the unlimited to be a this something, such as a human being or a horse, but in the way that we say that something is a day or a competition, for which the being does not come about as a sort of substance, but always consists in a process of coming to be and passing away: a limited thing [at each stage], yet always *one thing followed by another.*[312]—In magnitudes, however, what was taken remains, while in the case of time and human beings what is taken is destroyed but in such a way that the supply does not give out.

The unlimited by addition is in a way the same as that by division. For in what is limited the one by addition occurs in an inverse way.[313] For as it is seen being divided without limit, it will ipso facto appear that by being added it tends toward something definite.[314] For if in a limited magnitude one takes a definite part, and then were [always] to add another determined by the same ratio [of part to whole] (that is, not taking the same particular quantity of the whole), one will not traverse the limited magnitude. But if one increases the ratio, so that one always takes the same particular quantity of the magnitude, one will traverse it, because every limited magnitude is exhausted by [taking in this way] any definite quantity whatsoever.[315]

In any other way, then, there is not anything unlimited, but in this way there is: potentially and by reduction, and in fact in the way in which we say a day is and a competition is, and potentially in the way that matter is, and not intrinsically in the way that what is limited is.[316]

The unlimited by addition too, then, exists potentially in this way: in the same sort of way, we say, as that by division. For although it will always be possible to take something external to it, it will of course not exceed every magnitude, in the way in which, in division, it exceeds every definite magnitude, and will always be smaller than it. So to exceed everything by addition is not possible even potentially, if indeed there is nothing that coincidentally is actually unlimited in the way that the physicists say that the body outside the cosmos, of which the substance is air or some other such thing, is unlimited.[317] But if there cannot be in this way a perceptible body that is actually unlimited, it is evident that there cannot be one that is even potentially unlimited by addition, except, as we said, in an inverse way to being so by division.[318] (It is because of this in fact that Plato posited two unlimiteds, namely, because there seems to be an excess and a going on without limit both in increase and in decrease.[319] But though he posits two, he does not use them. For in numbers the unlimited in decrease is not present, because the unit is the smallest one, and the unlimited in increase is not present either, because he posits numbers only up to ten.[320]

It turns out, then, that the unlimited is the contrary of what people say it is. For it is not what nothing is outside of, but rather what something is always outside of, that is unlimited.[321] **207b1** Here is a sign of this: people say that rings without a socket for a gemstone are unlimited, because it is always possible to take something that is outside.[322] But they say this in virtue of a certain similarity, and not using the term in the strict sense. For this must hold *and* the same thing must never be taken again. In the case of the circle, though, it does not happen that way, but only that the next thing is always a distinct one.[323] Something is unlimited, then, of which—when we are taking quantities—it is always possible to take something that is outside. On the other hand, what has nothing outside is complete and whole. For this is how we define what is whole, namely, as that from which nothing is absent—for example, a whole human being or a whole box. And just as with the particular case, so too with what is whole in the strict sense: it is what nothing is outside of. But what something is absent from and outside of is not an "all," whatever may be absent.[324] Whole and complete are either entirely the same or very close in nature.[325] Nothing is complete (*teleion*) that has no end (*telos*), and the end is a limit.

That is why Parmenides must be thought to have spoken better than Melissus. For Melissus says that the unlimited is a whole, Parmenides that the whole is limited, "equal in all directions from the middle."[326] For to connect the universe or whole to the unlimited is not a question of tying string to string, since it is from *this* they get the dignity that they ascribe to the unlimited: that it encompasses all things and contains all within itself, because it has some similarity to the whole.

In fact, though, the unlimited is the matter of the completeness that belongs to magnitude; is what is potentially but not actually a whole, being divisible by reduction and by its inverse, namely, addition; is a whole and limited not intrinsically but with regard to something else; and does not encompass but, insofar as it is unlimited, is encompassed.[327] That is why the unlimited, insofar as it is such, is unknowable, since the matter has no form.[328] So it is evident that the unlimited is found more in an account of a part than in that of a whole (for the matter is a part of the whole, just as the bronze is of the bronze statue). Since, if indeed the unlimited encompasses in the case of perceptibles, in the case of intelligible objects too, the great and the small should encompass them.[329] But it is absurd and impossible that the unknowable and indefinite should encompass and define.

III 7

It is in accord with reason too that there does not seem to be any unlimited by addition that is such as to exceed every magnitude, whereas there does seem to be one by division. For as the matter and the unlimited are what are encompassed and inside, the form is what encompasses.[330] It is also reasonable that while there is a limit in number in the direction of the least, in the direction of the greater there is a number that exceeds any plurality, and that in the case of magnitudes, on the contrary, while any magnitude is exceeded in the direction of the less, in the direction of the greater there is no unlimited magnitude. The cause is that what is one is indivisible, whatever may be one (for example, a human being is one human being and not many), whereas number is a plurality of ones—a certain many of them. So there must be a stop at the indivisible. (For "two" and "three" are paronymous names, and similarly with each of the other numbers.[331]) In the direction of the greater, however, it is always possible to think of [a greater number], since the bisections of a magnitude are unlimited.[332] So it exists potentially, not actively, although what is grasped always exceeds any definite plurality. But this number is not separable from the process of bisection, and the unlimited does not stand fast but comes to be, just like time and the number of time.[333]

In the case of magnitudes on the other hand the contrary holds. For the continuous is unlimitedly divisible, whereas there is no unlimited in the direction of the greater. For whatever size a [perceptible] magnitude can be potentially, it can also be actively. So, since no perceptible magnitude is unlimited, it is impossible to exceed every definite magnitude—for then there would be something greater than the heaven.[334]

The unlimited is not the same thing in magnitude, in movement, and in time in the way that some one nature is. Rather, the posterior among these is said to be unlimited with reference to the prior—as, for example, a movement is said to be unlimited in virtue of the magnitude of the distance covered by a thing's movement, alteration, or increase, and the time because of the movement.[335] (For now let us make use of these notions, but later we shall state what each of them is and why every magnitude is divisible into magnitudes.[336])

Our account, though, in thus doing away with the active existence of an untraversable unlimited in the direction of increase does not deprive the mathematicians of their theoretical knowledge. For even as things stand they do not need the unlimited (since they make no use of it), but only that there should be a limited line of whatever length they wish. But another magnitude of any size you like can be divided in the same ratio as the greatest one can, so that, as regards proof at least, it makes no difference to them that its being among the magnitudes that actually exist is not necessary.[337]

Since there is a fourfold division of causes, it is evident that the unlimited is a cause in the way matter is, and that the being for it is lack, while the intrinsically underlying subject is what is continuous and perceptible. All the other thinkers as well evidently make use of the unlimited as matter. That is why it is absurd to make it what encompasses and not what is encompassed.[338]

III 8

It remains to go through the arguments that seem to support the view that the unlimited exists not only potentially but as something definite.[339] For some of them are not necessities, while others admit of other true replies.[340]

[3] In order that coming to be should not run out, it is not necessary for there to be a perceptible body that is actively unlimited. For it is possible for the passing away of one thing to be the coming to be of another, the universe being limited.

[4] Further, making contact and being limited are distinct. The former is a relation, that is, it is making contact with something, since everything that makes contact makes contact with something, and is a coincident of some limited things. But what is limited is not a relation. Nor is it possible for any random thing to make contact with any random thing.[341]

[5] It is absurd to put your trust in thought.[342] For then the excess and deficiency are not in the thing but in thought. For one might think of each of us as being many times as large as himself, increasing our size without limit. But it is not because of this, namely, that someone thinks it is so, that anyone exceeds the size of the town or the size that we have, but because it is the case—that someone thinks it is so is coincidental.[343]

[1] Time and movement are unlimited things, and so is thinking, in the sense that what is taken does not remain, whereas magnitude is not unlimited in thought either by way of reduction or by way of increase.

We have stated, then, in what way the unlimited exists and does not exist, and what it is.

Book IV

IV 1

It is likewise necessary for a natural scientist to know about place too, just as about the unlimited, whether it exists or not, what way it exists, and what it is. For everyone supposes that the beings are somewhere (for a non-being is nowhere—for where is a goat-stag or a sphinx?).[344] And movement in the most common and strictest sense, which we call "spatial movement," is movement with respect to place.[345]

The question of what place is, however, involves many puzzles. For a theoretical grasp based on all the facts leads to conclusions that appear not to be the same. Further, we have nothing from previous thinkers either by way of going through the puzzles about it or of making us puzzle-free.[346]

That place exists seems to be clear from replacement. For where there is now water, there, when the water has gone out as from a vessel, air is in turn present. Then some other bodies occupy this same place.[347] The latter, then, seems to be something distinct from all the things that come to be in it and change. For what air is in now, water was previously in, so that it is clear that the place or space to which and from which they changed was something distinct from either of them.

Further, the spatial movements of the simple natural bodies—for example, fire, earth, and the like—make it clear not only that place is something but also that it has a certain capacity.[348] For each spatially moves to its own place if it is not prevented, fire up above, earth down below. Now these are the parts and species (*eidos*) of place—up and down and the rest of the six directions.[349] And these—up and down, right and left—are not just relative to us, since relative to us they are not always the same, but come to be in accord with our position, depending on how we are turned. That is why left and right are often the same, as are up and down, and before and behind. In nature, by contrast, each is distinct and separate. For up above is not some random thing, but where fire and what is light spatially move to. Similarly, down below is not some random thing, but where what has heaviness and what is earthy spatially move to, as differing not in position alone but in capacity as well. (Mathematical objects also make this clear. For though they are not in a place, nonetheless they have a right and left in accord with their position relative to us, in the sense in which these are said of things merely because of their position, and not in the sense of having either of them by nature.) Further, those who say that a void exists say that place does, since a void would be a place lacking body.

It is through these considerations, then, that one might take place to be something beyond bodies, and all perceptible bodies to be in a place. And even Hesiod might seem to be speaking correctly in making chaos come first.[350] At any rate, he says:

> Of all things the very first that came to be was chaos, and then
> Broad-breasted earth,

on the supposition that there needs first to be a space for the beings, because he believed, as most people do, that everything is somewhere and in a place. If this is so, however, then the capacity of place must be a wonderful one and prior to all things, since that without which nothing else can exist, whereas it can exist without the others, must be first.[351] For place is not destroyed when the things in it pass away.

Yet there is still a puzzle, if place exists, as to what it is, whether some sort of volume, some sort of body, or some other sort of nature. In fact, we must first inquire into what its genus is.

[P1] Well, it has three dimensions, length, breadth, and depth, by which every body is bounded. But a place cannot be a body, since then there would be two bodies in the same thing.

[P2] Further, if indeed a body has a place and a space, it is clear that surface and the rest of a body's limits do as well, since the same argument will apply. For where previously the surfaces of the water were, there those of the air in turn will be. But we have no way to distinguish between a point and the place of a point. So if the place of a point is not distinct from it, neither will that of any of the others be, and nor will place be something beyond each of these.

[P3] What on earth, then, are we to suppose place to be? For if it has a nature of the aforementioned sort, it cannot be an element or composed of elements, whether of corporeal or of incorporeal ones.[352] For while it has magnitude, it has no body. The elements of perceptible bodies, by contrast, are bodies, while from intelligible objects no magnitude comes to be.[353]

[P4] Further, of what in beings could one suppose place to be the cause? For not one of the four causes is present in it. For it is neither a cause as matter for the beings (since nothing is composed of it), nor as form and account of things, nor as end, nor does it cause the beings to move.[354]

[P5] Further, if it is itself one of the beings, it will be somewhere. For Zeno's puzzle demands some argument [in response].[355] For if every being is in a place, it is clear that place too will have a place, and so on without limit.

[P6] Further, just as every body is in a place, so too in every place there is a body, so what are we to say about things that increase in size? For from what has been said it must be that their place increases along with them, if each of their places is neither smaller nor larger than they are.

Due to these things, then, it is necessary to puzzle over not only what place is, but also whether it exists.

IV 2

Some things are said to be something intrinsically, others by virtue of another thing, and place may be either the common place in which all bodies are or the special one, which a given body is in first. I mean, for example, that you are now in the heaven because you are in the air and it is in the heaven, and you are in the air because you are on the earth, and similarly you are on it because you are in *this* place, which encompasses no more than you.

If, then, place is the first thing encompassing each body, it would be a certain limit, so that the place would seem to be the form and the shape of each body, by which the magnitude, and the matter of the magnitude, are bounded, since this is a limit of each. If one investigates it in this way, then, place is the form of each thing. But insofar as place seems to be the extended space for the magnitude, it is the matter.[356] For this is distinct from the magnitude: it is what is encompassed and bounded by the form, as by a surface, that is, a limit. And this is the sort of thing that the matter and the indefinite are. For when the limit and the attributes of a sphere are subtracted, nothing is left beyond the matter.

That is why Plato too says in the *Timaeus* that matter and space are the same thing, since "the participative" and space are one and the same.[357] Although he spoke of the participative in another way in the so-called unwritten doctrines, nonetheless he still declared that place and space were the same thing. In fact, while everyone says that place is something, he alone tried to say what it is.

It makes perfect sense, then, that when we investigate the question on the basis of these considerations it seems difficult to know what place is, if indeed it is one or the other of these two things, either matter or form. In any case, not only do these in fact involve theoretical knowledge of the highest sort, but it is not easy to know them separate from each other.[358]

But surely it is not difficult to see at least that it is impossible for place to be either of them. For the form and the matter are not separate from the thing, whereas the place admits of being so. For what air was in, water in turn comes to be in, as we said, when the water and the air replace each other, and similarly when other bodies do.[359] So the place of each thing is neither a part nor a state of it, but is separable from it.[360] And in fact place seems to be something like a vessel (for a vessel is a transportable place). The vessel, though, is no part of the thing. Insofar, then, as it is separable from the thing, place is not the form; and insofar as it encompasses, it is distinct from the matter. Also, what is somewhere always seems both itself to be something and to have some distinct thing outside it. (Plato of course ought to tell us, if we may make a parenthetical comment, why the Forms and the numbers are not in a place, if indeed place is the participative, whether the participative is the great and the small or matter, as he writes in the *Timaeus*.[361])

Further, how could a thing spatially move to its own place, if the place is the matter or the form? For it is impossible for that of which there is no movement and no up and down to be place. So place must be sought among things that are of this sort. And if place is in the same thing, as it must be if indeed it is either shape or matter, place will be in a place. For both the form and the indefinite change and are moved at the same time as the thing, and are not always in the same place, but are just where the thing is.[362] So there will be a place of the place.

Further, when water comes to be from air, the place has been destroyed, for the body that comes to be is not in the same place. What, then, is the passing away of a place?

It has been stated, therefore, that on the basis of these considerations place must be something, and, again on their basis, that puzzles might be raised as to what its substance is.[363]

IV 3

We must next get a grasp on how many ways one thing is said to be *in* another.[364] [1] One way, then, is as the finger is in the hand, and, in general, as the part in the whole. [2] Another, as the whole is in the parts, since the whole does not exist beyond the parts. [3] Another way, as human is in animal, and in general species in genus. [4] Another, as the genus is in the species, and in general the part of the species in the account.[365] [5] Further, as health is in hot and cold things, and in general the form in the matter.[366] [6] Further, as the affairs of the Greeks are in the king, and in general in the first thing capable of causing movement.[367] [7] Further, as in the good, and in general as in the end (that is, the for-the-sake-of-which).[368] [8] In the strictest way of all, as a thing is in a vessel, and in general in a place.

One might also raise a puzzle as to whether a thing can possibly be in itself, or nothing can, but rather everything is either nowhere or in something else. And this in two ways, either intrinsically or by virtue of something else.[369] For when what is in something and what it is in are parts of the whole, the whole will be said to be in itself. For things are also said to be what they are with reference to their parts—for example, a human being is said to be pale, because his surface is pale, or to know science because his rationally calculative part does.[370] The jar, then, will not be in itself, nor will the wine, but the jar of wine will be, since the thing that is in something and the thing it is in are both parts of the same thing.

In this way, then, it is possible for a thing to be in itself, but in the primary way it is not possible.[371] For example, the pale is in a body (since the surface is in a body), and the scientific knowledge in a soul, and [the human being] is called what he is with reference to these, which are parts—at any rate when considered as in a human being. (For the jar and the wine are parts, not when separate, but when they are together. That is why, when they are parts, the thing will be in itself.) For example, the pale is in a human being because it is in a body, and it is in a body because it is in a surface, but it is not any longer in a surface in virtue of something else. And these things—the surface and the pale—are distinct in form, and each has a distinct nature and capacity.[372]

When we investigate inductively, then, we do not see anything being in itself in any of the ways distinguished, and when we do so by argument it is clear that it is impossible.[373] For each of the two things would have to be both of them—for example, the jar would have to be both the vessel and the wine, and the wine both the wine and the jar, if indeed it is possible for a thing to be in itself. So, however much they may be in each other, the jar will still be receptive of the wine not insofar as the jar is itself wine but insofar as it is a jar, and the wine will be in the jar not insofar as it is itself a jar but insofar as it is wine. It is clear, then, that with respect to their being they are distinct, since the account of the thing something is in is distinct from the account of the thing that is in it. Moreover, it is not possible coincidentally either, since then two things will be in the same [place] at the same time. For the jar will be in itself, if a thing whose nature is receptive can be in itself, and furthermore what it is receptive of—for example, if wine, then wine—will be in it.[374]

It is clear, then, that it is impossible for something to be in itself in the primary way.

Zeno's puzzle, that if place is something, it will be in something, is not difficult to resolve. For there is nothing to prevent the first place from being in something else, although not in the way in which the thing is in that place, but rather in the way in which health is in hot things as a state, or in which the hot is in the body as an attribute.[375] So it is not necessary to go on without limit.

In the other case, though, it is evident that since the vessel is no part of what is in it (for in the primary way what [something is in] and what is in it are distinct), place will not be either the matter or the form, but something else. For these are parts of what is in a place, namely, both the matter and the shape.

Let this, then, serve as going through the puzzles.[376]

IV 4

Just what place is should become evident from what follows. Let us assume about it, then, all the things that truly seem to belong intrinsically to it. We think, then, that: [1] place is the first thing encompassing that of which it is the place; and [2] is no part of the thing; further, [3] the primary place is neither less nor greater than the thing; further, [4] it can be left behind by the thing and is separable from it; in addition, [5] every place has an up and down; and [6] each body should by nature spatially move to and remain in its proper place, and this it does either upward or downward.[377] With these as hypotheses, then, we must get a theoretical grasp on the rest. And we must try to make our investigation in such a way that the what-it-is is given an account of, so that the puzzles are resolved, the things that are believed to belong to place will in fact belong to it, and furthermore, so that the cause of the difficulty and of the puzzles concerning it will be evident, since this is the best way of showing each thing.[378]

First, then, it should be understood that place would not be a topic of inquiry, if movement with respect to place did not exist. (For it is most of all because of this that we think that even the heaven is in a place, because it is always in movement.[379]) Of this movement, one sort is spatial movement, the other increase and decrease. For in increase and decrease too something changes, and what previously was *there* changes its place in turn into a larger or smaller one. And what is moved actively is so either [1] intrinsically or [2] coincidentally. And what is moved coincidentally is either [2a] what admits intrinsically of being moved—for example, the parts of the body and the nail in the ship; or [2b] what do not admit of it, but instead are always moved coincidentally—for example, paleness and scientific knowledge. For these change their place in this way: because what they are present in changes its place.

Now we say that something is in the heaven as being in a place, because it is in the air, and the air is in the heaven. And it is in the air, though not in all of it. But, because the innermost extremity of the air encompasses the thing, we say that it is in the air. For if all the air were its place, the place of a given thing would not be equal to the thing. But it certainly seems to be equal, and the primary place in which it is, is of this sort. So [1] when what encompasses a thing is not divided from it but continuous with it, the latter is said to be in the former not as in a place, but as the part is in the whole. On the other hand, [2] when what encompasses it is divided from it and makes contact with it, the latter is first in the [innermost] extremity of the former, which is neither a part of what is in it, nor greater in extent, but equal to it, since the extremities of things that are making contact are in the same place.[380] And [1] if it is continuous with what encompasses it, it is moved not in it but with it; whereas if it is divided, it is moved in it, and whether what encompasses it is moved or not makes no difference.

Further, when it is not divided from what encompasses it, it is said to be in it as a part of a whole, as the pupil in the eye, or the hand in the body, whereas when it is divided, as the water in the vessel or the wine in the jar. For the hand is moved with the body, whereas the water is moved in the vessel.[381]

Now it is already evident from these considerations what place is. For there are pretty much four things of which place must be one: shape, matter, a certain extended space (the one in between the extremities), or the extremities, if there is no extended space beyond the magnitude of the body that comes to be in it. But it is evident that it cannot possibly be three of these.

[1] It is because it encompasses something that shape seems to be place. For the extremities of what encompasses something and of what it encompasses are in the same place. But though they are both limits, they are not limits of the same thing. On the contrary, the form is that of the thing, whereas the place is that of the encompassing body.

[2] Because the thing encompassed and divided from what encompasses it often changes, however, while the latter remains unchanged, like water poured from a vessel, what is in between seems to be something, on the supposition that the extended space is something

beyond the body that changes its place. But that is not so. Instead,
a random body, among those naturally capable of changing place
and of making contact with it, enters it. And if there were a certain
extended space that remained unchanged in its own place, then there
20 would be an unlimited number of places in the same [place].[382] For
when the water and the air change places, all the parts will do precisely
the same thing in the whole as all the water in the vessel does.
At the same time the place too will be undergoing change, so that
there will be another place, which is that of the place, and many
25 places will be together. But the place of the part, in which it moves
when the whole vessel changes places, is not a distinct one; rather, it
is the same one.[383] For it is in the place in which they are that the air
and the water (or the parts of the water) change places, not in that
place in which they come to be, which is part of the place that is the
place of the whole heaven.[384]

[3] The matter too might seem to be place, if at any rate one investigated
something at rest and not separated but continuous. For just as,
30 if a thing undergoes alteration, there is something that now is pale but
once was dark, or now is hard but once was soft, which is why we say
that matter is something, so too place seems to exist because of a phenomenon
of this sort—except that in the former case it is because what
35 was air is now water, whereas place is thought to exist because where
there was air, there is now water. But the matter, as was said earlier, is
$212^{a}1$ neither separable from the thing nor encompasses it, whereas place is
or does both.[385]

Well then, if place is none of the three, neither the form, the matter,
nor some extended space which is always there, distinct from and
beyond the extension of the thing that changes its place, it must be
5 that place is the remaining one of the four, namely, the limit of what
encompasses something at which it is in contact with what is encompassed.
6a (By "what is encompassed" I mean body that can be moved by
way of spatial movement.)

Place seems to be something important and difficult to grasp, both
because the matter and the form appear alongside it and because
the change of place of a moving body occurs within an encompassing
10 body that is at rest. For it seems possible that there is an extended
space in between that is something distinct from the magnitudes that
move. And air contributes something to the belief by seeming to be
incorporeal. For it is not only the limits of the vessel that appear to
be in a place, but also what is in between them, which is regarded as
being void. And just as a vessel is a place that can be carried around,
15 so a place is a vessel that cannot be moved around. That is why, when

something moves and changes inside something that is in movement (for example, a boat on a river), the thing that encompasses it serves more as a vessel than a place, since a place is meant to be immovable. That is why it is more the whole river that is the place, because as a whole it is immovable.[386] So the first immovable limit of what encompasses the thing—this is its place.[387]

And this is why the center of the heaven and the extreme limit (relative to us) of its circular spatial movement seem to everyone to be most of all "up" and "down" in the strict sense, because the center always remains at rest, and the ultimate limit of the circle remains as it was.[388] So, since what is light is what by nature spatially moves upward, and what is heavy is what by nature spatially moves downward, the encompassing limit in the direction of the center is down, as is the center itself, whereas the one in the direction of the extremity is up, as is the extremity itself. And it is because of this that place is thought to be a sort of surface, and like a vessel and something that encompasses a thing. Further, place is together with the thing, since the limits are together with what is limited.

IV 5

A body, then, that has some outside body encompassing it is in a place, whereas one that hasn't is not. That is why, even if something of the latter sort were to be water, its parts will be moved, since they encompass each other, whereas the all will in one way move and in another not.[389] For considered as a whole it does not at one and the same time change its place, though it will be moved in a circle, since this involves only the place of the parts. And some of these are moved not upward and downward but in a circle, others upward and downward, namely, those that admit of condensation and rarefaction.

As was said, though, some things are potentially in a place, others actively.[390] That is why, when a homoeomerous thing is continuous, the parts are potentially in a place, whereas when they are separated yet in contact, as in a heap, they are actively so.[391]

Also, [1] some things are intrinsically in a place. For example, every body that is movable either by way of spatial movement or by way of increase is intrinsically somewhere. But the heaven, as has been said, is not anywhere as a whole, nor in any place, if at any rate no body encompasses it; yet as it *is* moved, it is in fact a place for its parts, since they are in contact with each other.[392]

Other things, by contrast, are coincidentally in a place—for example, the soul and the heaven (for its parts are all in a way in a place, as one encompasses another on the circle). That is why what is up above is moved in a circle, though the universe is not anywhere. For what is somewhere is both itself something and, furthermore, there must be something else beyond it that it is in, namely, what encompasses it. But beyond the universe or the whole there is nothing that is outside the universe, and that is why everything is within the universe, since the heaven, presumably, is the universe. Yet their place is not the heaven, but a part of the heaven, which is an extreme one and one that makes contact with the moveable body. That is why the earth is in the water, the water in the air, the air in the ether, and the ether in the heaven, while the heaven is no longer in anything else.[393]

It is evident from these considerations that all the puzzles will also be resolved if we speak of place in the foregoing way.[394] For: [P6] it is not necessary for the place to increase along with the thing in it, or [P2] for a point to have a place, or [P1] for two bodies to be in the same place, or [P3*] for place to be some corporeal extension (for what is between [the limits] of the place is whatever random body it may be, not the extension characteristic of a body). Also, [P5] place too is somewhere, although not as in a place, but in the way that a limit is in what is limited. For not every being is in a place, but [only] movable body.

Also, it is reasonable, then, that each of them moves to its own place. For what is adjacent to something and not by force in contact with it is of the same kind (*suggenês*) as it—if they are naturally unified, they cannot affect each other, whereas if they are [by force] in contact, one is affected and the other affects it.[395]

Also, that each should by nature remain in its proper place is not unreasonable, since so does the part in the whole, and what is in a place as a detached part in relation to the whole, as when one causes movement in a part of water or of air. It is in this way too that air is related to water, since the one is as it were matter, the other form—water is the matter of air, while air is as it were a sort of activation of water, since water is potentially air, whereas air is potentially water in another way.[396] (We must, however, make determinations about these topics later, although it is necessary, because the occasion calls for it, to say what we have said; what has now been stated in a non-perspicuous way, though, will then be stated in a more perspicuous one.[397]) If, then, the same thing is matter and actuality (in fact, water is both, but one potentially and the other actually), it will be related somehow as a part to the whole. That is why these things have contact, and are naturally unified, when they both become actively one.

We have stated, then, both that place exists and what it is.

IV 6

In the same way, we should suppose that it belongs to the natural sci-
entist to get a theoretical grasp on the void as well, as to whether it
exists or not, in what way it exists, and what it is, just as in the case of
place. And in fact conviction and lack of conviction are quite similar
in the two cases, because of what people assume. For those who speak 15
of a void as existing suppose it to be as it were a sort of place or vessel,
which seems to be a plenum when it contains the volume it is capable
of receiving, and a void when it lacks it, on the supposition that void,
plenum, and place are the same thing, although the being for them is
not the same.[398]

We must start the investigation, however, by grasping what is said
by those who assert that a void exists, then what is said by those who 20
deny that it does, and third the common beliefs about it.

Those, then, who try to show that a void does not exist in fact refute
not what people mean by "void," but what they in error say about it, as
Anaxagoras does and those who try to refute it in this way.[399] For they
show that air is something, by twisting wineskins and showing how 25
strong the air is, and by trapping it in clepsydras.[400]

But what people mean by "void" is an extended space in which there
is no perceptible body. They, however, thinking that all being consists
of bodies, say that what there is nothing at all in is void, because what
is full of air is void. But it is not this that needs to be shown, that air 30
is something, but that there is no extended space, either separable or
actively existing, that is distinct from bodies, and that divides the totality
of body so that it is not continuous (as Democritus, Leucippus, and
many other of the physicists say), or is perhaps even outside the totality $213^{b}1$
of body, which is continuous.

These thinkers, then, do not meet the problem head on, but rather
those who say that a void does exist. [1] And they say, for one thing,
that there would be no movement with respect to place (that is, spatial
movement and increase). For [they say that] there would not
seem to be movement, if there were no void, since a plenum cannot 5
be receptive of anything. For if it were to be receptive of something,
and there were two things in the same place, it would be possible for
any number of bodies whatsoever to be together, since one cannot say
what difference in number would cause what is stated not to hold.[401]
But if this is possible, then the smallest thing will be receptive of the
greatest, since a great thing is many small ones. So if it is possible that 10
many equal things should be in the same place, it is possible that many
unequal things should be. (Melissus even shows on the basis of these

considerations that the universe is immovable. For if it is to be moved, there must (he says) be a void, but a void is not among the beings.) One way, then, in which they show that a void is something is on the basis of these considerations.

[2] Another is from the fact that some things are seen to contract and be compressed—for example, they even say that wine-jars will be receptive of the wine along with the wineskins, on the supposition that the condensed body contracts into the voids within itself.[402]

[3] Further, increase too seems to all of them to occur by means of a void. For nourishment is a body, and it is impossible for two bodies to be together [in exactly the same place].

[4] They also produce as evidence the [vessel] that surrounds ashes, which is receptive of as much water as the empty vessel.[403]

[5] The Pythagoreans too said that a void exists, and that it enters the heaven itself from the unlimited breath, as the heaven is also inhaling the void, which distinguished the natures of things, since it is what separates and distinguishes the successive things in the series. This happens first in the case of the numbers, since the void distinguishes their nature.[404]

The grounds, then, on which people say that there is, or that there is not, a void are pretty much these and this many.

IV 7

As a step toward determining which of these two alternatives holds, we need to grasp what the name "void" signifies. A void, then, seems to be a place with nothing in it. The cause of *this* is that people think that to be is to be a body, that every body is in a place, and that a void is a place in which there is no body, so that if there is no body somewhere, then there is nothing there. Moreover, they think that every body is tangible, and that whatever has heaviness or lightness is of this sort. It follows by deduction, then, that a void is what there is nothing heavy or light in.[405] These things, then, as we said before, follow by deduction. It is absurd, then, to ask whether a point is a void, since a void must be a place within which there is an extended space for a tangible body.

But in any case it appears that [1] something is said to be a void in one way when it is not filled with a body that is perceptible to touch. (What is perceptible to touch, though, is whatever has heaviness and lightness.[406] That is why someone might raise a puzzle as to what people would say if the extended space contained a color or a sound—is it a void or not? Or is it clear that [they would respond that] if it were receptive of tangible body, it would be a void, and if not, not?) [2] In another way, it is said to be a void when there is not a this something in it, nor a corporeal substance. That is why some people say that a void is the matter of a body (and they say that the place too is this same thing), but they do not speak correctly. For the matter is not separable from the things, but they are inquiring about the void on the supposition that is separable.

Since we have discussed place, and void must, if it exists, be place lacking body, and it has been stated in what way place exists and in what way it does not, it is evident that a void does not exist as a place lacking body, whether separated or un-separated.[407] For a void is meant to be not a body but rather an extended space for a body. That is also why a void too seems to be something, namely, because place is, and because of the same considerations. For movement with respect to place comes to the aid both of those who say that a place is something beyond bodies that come to occupy it and of those who say the same about a void. They think that a void is a cause of movement in the sense of being what movement takes place in, and this would be the sort of thing that some people say place is.

But there is no necessity whatsoever, if movement exists, for there to be a void. In general, as regards all movement, it is not necessary in the least, due to something that Melissus also overlooked, namely, that is possible for a plenum to undergo alteration.[408] But then it is not necessary for movement with respect to place either, since it is possible for things to make way for each other all at once, even though there is no separated extended space beyond the moving bodies. And this is clear in the rotations of continuous things, just as it is too in those of liquids.

Also, it is possible for things to be condensed not into a void but through the squeezing out of what is contained in them (for example, the air inside when water is condensed), and for it to increase not only by the entry of something else, but also by undergoing alteration—for example, when air comes to be from water.[409]

In general, both the argument about increase and about the water poured on the ashes are self-impeding, since either [1] not any and every part increases; [2] it does so not by the addition of body; [3] it is possible for two bodies to be in the same place; or [4] it is necessary for the whole body to be a void, if it increases at every point and increases by means of a void.[410] They are requiring that we resolve a puzzle common to both sides, then, not showing that a void exists.[411] The same argument applies to the ashes as well.

It is evident, then, that it is easy to resolve the puzzles on the basis of which they show that a void exists.

IV 8

Let us go back to saying that no separated void exists in the way in which some people say it does. [1] For if each of the simple bodies has by nature a certain spatial movement (for example, fire upward and earth downward or toward the center), it is clear that a void would not be the cause of their spatial movement.[412] Of what, then, will a void be a cause? For it is thought to be a cause of movement with respect to place, but is not a cause of this.

[2] Further, if when a void exists there is something like a place lacking a body, where will a body placed in it spatially move to? For it certainly cannot be to all of it. The same argument applies as to those who think that place is something separated that things spatially move to. For how will what is placed in it spatially move? Or will it remain at rest? And it makes perfect sense that the same argument fits both in the cases of the up and the down and also in the case of a void, since those who say that a void exists make it a place.

[3] Also, in what way will something be in either a place or a void? For it does not result [as the defenders of the void suppose] when some whole is put in a separated place that is in some body that remains.[413] For a part of it, if not put in separately, will not be in a place but in the whole body.[414] [4] Further, if a separated place does not exist, neither will a separated void.

[5] As for those who say that it is necessary for a void to exist if indeed there is to be movement, what results turns out to be the contrary, if one investigates the issue, namely, that it is not possible for anything at all to move if a void *does* exist.

[5a] For just as some people say that the earth is at rest because of the sameness [of what surrounds it], so in a void too it is necessary to be at rest, since there is nowhere for it to move to more or less [than to any other], since a void admits of no differentiation (*diaphora*).

[5b] Again, every movement is either by force or in accord with nature. And if there is the sort that is by force, there must also be the sort that is in accord with nature, since the sort that is by force is contrary to nature, and the sort that is contrary to nature is posterior to the sort that is in accord with nature. So if each of the natural bodies does not have a natural movement, they will not have any of the other movements either. Moreover, how can there be movement that is by nature, if there is no differentiation throughout the void and the unlimited? For insofar as it is unlimited, there will be no up, down, or center, and, insofar as it is a void, up will be no different (*diaphora*) from down. For just as there is no differentiation of non-being, so neither is there any

of the void, since a void seems to be a non-being and a lack. But spatial movement that is by nature is differentiated, so that [up, down, and middle] will be by nature different. Either, then, nothing whatsoever has any spatial movement that is by nature, or else there is no void.

[5c] Further, as things stand, things that are thrown move when what propelled them is not in contact with them—whether because of reciprocal replacement, as some people say, or because the air that has been propelled propels them with a movement that is faster than the spatial movement by which what is propelled spatially moves to its proper place.[415] In a void, though, none of these things holds, nor can anything be moved except in the way that what is carried is moved.[416]

[5d] Further, none of these thinkers would be able to say why something that has been caused to move will stop somewhere, since why should it do so *here* rather than *there*? So a thing must either be at rest or must spatially move on without limit, unless something stronger impedes it.

[5e] Further, as things stand something is thought to spatially move in a void because the void yields to it, but in a void such yielding is everywhere alike, so that it will move in every way.[417]

Further, the truth of what is being said is evident from the following considerations. [5f] For we see that the same weight and body spatially moves faster due to two causes, either [5f-i] because of a difference in the medium through which it spatially moves (for example, through water or earth, or through water or air) or [5f-ii] because what spatially moves, other things being equal, is different with respect to excess of heaviness or lightness.[418]

[5f-i] Now the medium through which it spatially moves is a cause, in that it impedes the thing, most of all if its spatial movement is in the opposite direction, and next most if it remains unchanged. And more so a medium that is not easily divided, and a denser medium is of this sort. A, then, will spatially move through B in time C, and through D, which is more fine-grained, in time E, these being proportional to [the density of] the impeding body, provided the length of B is equal to that of D. For example, let B be water and D be air, then to the degree that air is more fine-grained and less corporeal than water, to that degree A will spatially move through D faster than through B. Let speed stand in the same ratio to speed, then, as air differs in density from water, so that if air is twice as fine-grained, B will spatially move through in twice as much time as it takes to move through D, and the time C will be twice the time E. It will always be, then, that to the degree to which the medium spatially moved through is more incorporeal, less impeding, and more easily divisible, the speed will be faster.

Now there is no ratio in which a void is exceeded by a body, just as
there is none of nothing to a number. (For if four exceeds three by one,
and two by more than one, and one by even more than that by which
15 it exceeds two, still there is no ratio by which it exceeds nothing. For
what exceeds must be divisible into the excess plus what is exceeded,
so that four will be what it exceeds nothing by plus nothing.) That is
also why a line does not exceed a point, if a line is not composed of
points.[419] Similarly, a void cannot bear any ratio to a plenum, so that
20 neither can movement in one bear any ratio to movement in the other.
Instead, if a thing spatially moves such-and-such a distance in such-
and-such a time through the finest-grained medium, then through a
void it exceeds every ratio. For example, let F be a void, equal to B and
D. Then if A traverses and will move through it in a certain time G, less
25 than time E, this [ratio of G to E] is the ratio that a void will bear to a
plenum. In a time equal to G, however, A will traverse a part H of D.
And it will surely also traverse in that time any body F that exceeds air
in fine-grainedness in the same ratio as time E bears to time G. For if
30 a body F is as much more fine-grained than D as E exceeds G, A, if it
spatially moves through F, will traverse it in the same amount of time
216a1 as G with a speed that is inversely proportional. If, therefore, there is
no body in F, A will traverse it even faster. But the assumption was that
it would do so in G.[420] So it will traverse F in an equal time whether
F is a plenum or a void. But this is impossible. It is evident, therefore,
that if there is a time in which A will spatially move through any part
5 whatsoever of a void, then this impossible result will follow. For it will
be found to traverse in an equal time a plenum and a void, since there
will be some body that bears to the other the same ratio as the time
does to the time.

To speak in summary form, the cause of this result is clear, namely,
that between one movement and another movement there is a ratio
(for movement is in time, and between time and time there is a ratio,
10 provided both are limited), whereas between void and a plenum there
is not one.

These then are the consequences that result from a difference in
the media through which a body spatially moves. With regard to the
excess of the bodies that are in spatial movement, on the other hand,
they are as follows.

[5f-ii] We see that the things that have a greater balance-weight of
heaviness or lightness, other things being equal, spatially move across
15 equal distances faster, and in accord with the ratio that their magnitudes
bear to each other.[421] So they will do so through a void as well.
But this is impossible. For due to what cause will one spatially move

across it faster? In plenums, indeed, this happens of necessity, since the greater one divides it faster by means of its strength, since the thing that is in spatial movement or is projected divides it either by means of its shape or by the balance-weight that it has. So all will spatially move with equal speed. But this is impossible.

It is evident, then, from what has been said, that if there is a void what results is the contrary of what those who say that there is a void trumped one up for.

Now some people think that if indeed there is to be movement with respect to place, a void must exist that is intrinsically set apart. But this is the same as saying that a place is something separated; and that this is impossible was stated earlier.[422] But even if we investigate it intrinsically, the so-called void will evidently be truly void. For just as, if one puts a cube in water, as much water as the cube will be displaced, so it is in the case of air too, although to perception this is unclear. And, accordingly, in the case of every body that can be displaced, it is always in the direction natural for it that it is displaced (provided it is not compressed), that is, always displaced downward (if its spatial movement, like that of earth, is downward) or upward (if fire), or in both directions—depending on whatever sort of body is inserted. But in the void, of course, this is impossible (for it is no sort of body). [Instead, it must be that] throughout the cube an equal extent of void must have penetrated, precisely the one indeed that was previously in the void, just as if the water or air had not been displaced by the wooden cube, but had penetrated it at every point.

Moreover, the cube at any rate also has a magnitude equal to that of a void it occupies. And even if this is also hot or cold, heavy or light, the being for it is nonetheless distinct from all its attributes, even if not separable [from them]—I mean the volume of the wooden cube.[423] So even if it were separated from all the rest and was neither heavy nor light, it will occupy an equal amount of void and will be in the same part of the place and of the void as is equal to itself. How then will the body of the cube differ from the void or place that is equal to it? And if there are two such things, why can't there be any number whatsoever in the same place? This, then, is one absurd and impossible consequence.

Further, it is evident that the cube will have this same volume even if it is displaced, and all other bodies also have this feature. So if it is no different from place, what need is there to posit a place for bodies beyond the volume of each, if the volume is without attributes? For it contributes nothing, if there is another equal extended space of this sort round about it.

Further, it should be clear what sort of thing a void is in things in movement. But as things stand it exists nowhere in the cosmos. For air is something, although it does not *seem* so—nor would water seem so to fish, if fish were made of iron, since what is tangible is discerned by touch.[424]

It is clear from these considerations, therefore, that there is no separated void.

IV 9

There are some people who, because of the rare and the dense, think that it is evident that a void exists. For if rare and dense do not exist, it is impossible to contract and be compressed. But if this is not possible, either there will be no movement at all, or the whole universe will bulge, as Xuthus said, or change, for example of air and water, must always be into equal amounts (I mean, for example, that if air comes to be from a cup of water, then at the same time from an equal amount of air a cup of water must have come to be), or a void must exist.[425] For compression and expansion are not possible otherwise.

Now if they say that the rare is what contains many separated voids, then it is evident that, if it is no more possible for there to be a separable void than it is for there to be a place that has an extension within itself, neither can what is rare exist in this way.[426] But if they say that, though it is not separable, there is still some void present there, this is less impossible. It follows, however, first that the void is the cause not of all movement, but rather of movement upward (for what is rare is light, which is why they say that fire is rare); and second that the void will be a cause of movement not in the way the medium is, but rather, just as wineskins, by being in spatial movement upward themselves, carry along what is continuous with them, so the void carries things upward. Yet how can there be a spatial movement of a void, or a place of a void? For what a void spatially moves into then comes to be a void of a void.

Further, in the case of what is heavy, how will they give an account of its moving downward? Also, it is clear that if the rarer and more void a thing is, the more it will be carried upward, then if it were wholly void, it would be carried fastest. Presumably, though, even this is impossible, that it should move at all. And the same argument that shows that all things are immovable in a void also shows that a void is immovable, since the speeds are incomparable.[427]

Since we say that a void does not exist, though the rest of the puzzle has been truly stated (namely, that either there will be no movement, if there is no condensation and rarefaction, or it will always be that equal amount of water comes from air and air from water, since it is clear that a greater volume of air comes to be from water), it must be, therefore, if there is no compression, either that the next thing will be pushed outwards and so on, making the extremity bulge, or that somewhere else an equal amount of water must change from air, in order that the entire volume of the whole may be the same, or that nothing moves. For whenever there is displacement this will always happen, unless it comes around in a circle. Spatial movement, however, is not always in a circle, but also in a straight line.[428]

Because of these considerations, then, they would say that a void exists. We say, by contrast, on the basis of our assumptions, that: [1] there is one matter for the contraries hot and cold, and the other natural contrarieties; [2] what is actively comes to be from what is potentially; [3] the matter is not separable, although the being for it is different; and [4] the matter, as it may be, of color and of hot and cold, is one in number. Further, [5] the matter of a body, both large and small, is the same—and clearly so. For when air comes to be from water, the same matter, not by acquiring something in addition, becomes another thing—although what it was potentially it becomes actively—and, again, water comes to be from air in the same way, the change being sometimes to greatness from smallness, sometimes to smallness from greatness.[429] Similarly, therefore, if much air comes to occupy a smaller volume, or when from a smaller one it comes to be a greater, it is the matter, which is potentially both, that comes to be [one or the other]. For just as the same matter comes to be hot from cold and cold from hot, because it was so potentially, in the same way from being hot it comes to be more hot, though nothing in the matter comes to be hot that was not hot when the thing was less hot. Just as indeed if the arc or **217ᵇ1** convexity of a larger circle comes to be that of a smaller circle (whether or not it is the same arc), what is convex has not come to be in anything that was not convex but straight, since it is not by there being intervals that there is less or more.[430] Nor can we take any magnitude of flame in which hotness and whiteness are not present.[431] In the same way, therefore, the former heat is related to the later one. Thus both the greatness and smallness of the perceptible volume are extended not because of the matter acquiring something in addition but because it is potentially the matter of both, so that the same thing is dense and rare, and the matter of them is one.

{Further, just as the arc of a circle when contracted into a smaller space does not acquire some other part that is convex, but rather what was there has been contracted; and just as any part of fire that one takes will be hot; so too all cases that are by contraction and expansion of the same matter.}[432]

The dense is heavy and the rare is light. For there are two sorts in each case, that is, of the dense as well as of the rare. For both the heavy and the hard seem to be dense, and their contraries, the light and the soft, to be rare. The heavy and the hard clash, however, in the case of lead and iron.[433]

From what has been said, then, it is evident that a void does not exist either set apart—whether unconditionally or in the rare—or potentially, unless one wishes, no matter what, to call the cause of being carried along "a void."[434] In that sense, the matter of the heavy and the light, insofar as they are such, would be the void. For the dense and the rare are, with respect to this contrariety, productive of spatial movement, and with respect to the hard and the soft, of being affected and not being affected.[435]

Concerning the void, then, both the way it exists and the way it does not, let things be determined in this way.

IV 10

After what has been said, the next thing to go through is time. First, it is well to go through the puzzles about it, and through the external accounts, to see whether it is among the beings or the non-beings, and then what its nature is.[436]

That time either does not exist at all or does so scarcely or in a vague way might be suspected on the basis of the following considerations:

[P1] One part of time has been and is not, while another part of it will be and is not yet. And from these both unlimited time and whatever time is taken on any given occasion are composed. What is composed of non-beings, however, might seem to be incapable of participating in being.

[P2] In addition, in the case of everything that is divisible into parts, if it is, it is necessary that, when it is, either all or some of its parts must be. In the case of time, by contrast, although it is divisible into parts, some parts have been, some parts are to be, but none is. For the now is not a part.[437] For a part is measured, and the whole is composed of parts.[438] But time does not seem to be composed of nows.

[P3] Further, it is not easy to see whether the now, which appears to divide the past from the future, [P3a] remains one and the same on all occasions, or [3b] is a distinct thing on distinct ones. [P3b] For if it is always a distinct one on a distinct occasion, and if distinct parts in time are not simultaneous (unless one encompasses and the other is encompassed, as the shorter time is encompassed by the longer), and if the now that is not but was previously must have passed away at some time, then the nows will not be simultaneous either, and it must always be that the previous now has passed away. Well, it cannot have passed away in itself, because it then exists, whereas to have passed away in another now is impossible for a previous now. For we take it that it is impossible for nows to be contiguous to each other, as it is for a point to be contiguous to a point. If indeed, then, it has not passed away in the next now, but in another one, it will be simultaneously in the nows in between them, which are unlimitedly many.[439] But this is impossible.

[P3a] But then it is not possible either for the now to remain the same on all occasions. [P3a-i] For nothing that is divisible and limited has [only] one limit, whether it is continuous in one direction or in more than one; but the now is a limit, and it is possible to take a limited time.[440] [P3a-ii] Further, if to be together with respect to time, and neither before nor after, is to be at one and the same now, and if earlier and later nows are at this very now, then events of ten thousand years ago will be simultaneous with events of today and nothing will be either before or after anything else.

So much, then, by way of going through the puzzles concerning the things that belong to time.

As to what time is, and what its nature is, this is left equally unclear both by what has been handed down to us and by our own previous discussions. For some say that it is [1] the movement of the whole universe, others that it is [2] the sphere itself.[441]

[1] And yet a part of the revolution of the universe is also a time, but a revolution it certainly is not. For what was taken was a part of a revolution, not a revolution. Further, if there were more than one heaven, the movement of any whatsoever would equally be time, so that many distinct times would be together.[442]

[2] The sphere of the whole universe was believed to be time by those who said it was, because everything is both in time and in the sphere of the whole universe. But this view is too simpleminded for us to investigate its impossible consequences.

[3] But since time seems most of all to be a sort of movement and change, this we must investigate. Now [3a] the change and movement of a given thing is only in the thing that is changing, or wherever the thing itself that is moving and changing happens to be. Time, by contrast, is present equally everywhere and where everything is. Further, [3b] change is faster or slower, whereas time is not. For the fast and slow are defined by time—fast being what moves much in little time,

slow what moves little in much time. Time, though, is not defined by time, neither by its being so much nor by its being of a certain sort. It is evident, therefore, that time is not a movement—and it makes no difference to us at present whether we speak of movement or of change.[443]

IV 11

But then neither does time exist without change. For when we ourselves do not change in our thought or do not notice that we change, then it does not seem to us that time has passed, just as it does not seem to have done so to the fabled sleepers among the heroes in Sardinia when they wake up.[444] For they join together the earlier now to the later now and make them one, omitting what is in between because of their lack of perception. So just as if the now were not distinct but one and the same there would not have been time, in the same way when it is distinct, but is not noticed to be distinct, what is in between does not seem to be a time. If, then, our not thinking that there is time happens to us when we do not distinguish any change whatsoever, but rather the soul seems to remain in one indivisible now, and that when we perceive and distinguish, then we say that there is time, it is evident that time does not exist without movement and change. It is evident, then, that time neither is movement nor does it exist without movement. And since we are inquiring into what time is, we must start from this, and ask what thing belonging to movement it is.[445]

For we do perceive movement and time together. For even when it is dark and nothing affects us through the body, but there is some movement in the soul, it immediately seems to us that some time has passed. Moreover, when some *time* seems to have passed, some movement also seems to have occurred together with it. So time is either movement or something belonging to movement. Since then it is not movement, it must be something belonging to movement.[446]

Since what moves moves from something to something, however, and since every magnitude is continuous, the movement follows along with the magnitude.[447] For because the magnitude is continuous the movement is continuous too, and because the movement is the time is. For whatever the length of the movement is, that always seems to be the length of the time that has passed as well. Accordingly, the before and after is primarily in place, and *there* it is in their position. Since, though, the before and after is in the magnitude, it is necessary that the before and after is also in the movement, by analogy with the ones there. But then in time too the before and after is present, because of the one always following along with the other of them. Now the

before and after in movement is that thing, whatever it is, by being
which movement is [what it is], but the being for it is distinct and not 20
a movement.[448]

But then again we come to *know* time when we distinguish movement,
defining it by the before and after. And we say that time has
passed when we get a perception of the before and after in movement.
And we define it by grasping one [now] and then another, and 25
something else in between them.[449] For whenever we understand the
extremes to be distinct from what is intermediate, and the soul says
that the nows are two, one earlier and the other later, it is then, and it
is this, that we say time is. For what is given definition by the now is
believed to be time—and we may assume this.[450]

Whenever, then, we perceive the now as one, and not either as before 30
and after in the movement or as the same but belonging to something
that is before and after, no time seems to have passed, because there
seems to have been no movement either.[451] But whenever we do perceive
the before and after then we say that there is time. For time is just
this: a number belonging to change with respect to the before and after. **219ᵇ1**

Time is therefore not movement, but rather movement insofar as
it has a number.[452] A sign of this is the fact that we discern more and
less by number, but more or less movement by time. Time is therefore
a sort of number. Since, though, number is twofold (for both [1] what 5
is counted or what is countable and [2] what we count them with are
called number), time is, of course, what is counted and not what we
count by. And what we count by is distinct from what is counted.

Also, just as movement is always distinct on every occasion, so too
is time. But all simultaneous time is the same.[453] For the now (whichever 10
now it is) is the same, though the being for it is distinct.[454] And the
now measures time, insofar as it is before and after.[455]

The now, though, is in a way the same and in a way not the same.
For insofar as it occurs on different occasions it is distinct (this is what
it is for it to be a now), whereas that (whatever it is) by being which
the now is [what it is], is the same. For, as we said, movement follows 15
along with magnitude, and time follows along with movement, as we
are saying here.[456] And as in the case of the point, so in the case of
the thing in spatial movement by which we come to know movement
and the before and after in it.[457] And what is in spatial movement, in
respect of that thing (whatever it is) by being which it is [what it is],
is the same (whether a point, a stone, or something else of this sort),
but in account it is distinct—just as the sophists take Coriscus-in-the- 20
Lyceum and Coriscus-in-the-marketplace to be distinct.[458] What is in
spatial movement, then, is distinct by being in distinct places, and the

now follows along with what is in spatial movement, just as the time does with the movement. For it is by what is in spatial movement that we know the before and after in movement, and the before and after insofar as it is countable is the now. So in this case too that thing (whatever it is), by being which the now is [what it is], is the same, since it is the before and after in movement, although the being for it is different, since insofar as it is countable it is the now.

And it is this that is most knowable.[459] For the movement too is known by what is moving and spatial movement by what is in spatial movement. For what is in spatial movement is a this something, whereas the movement is not.[460] In one way, then, the now is always the same, and in another way not the same.[461] For what is in spatial movement is so too.

It is evident too that if time did not exist, the now would not, and if the now did not, time would not. For just as what is in spatial movement and its spatial movement are together, so too are the number of what is in spatial movement and its spatial movement. For the number of the spatial movement is time, while the now corresponds to what is in spatial movement, as a sort of unit of number.[462]

Also, time is both continuous by virtue of the now and divided at the now. For this too follows along with the spatial movement and what is in spatial movement. For the movement (that is, the spatial movement) is one by virtue of what is in spatial movement, because it is one—and not because that thing (whatever it is), by being which it is [what it is], is one (since that might leave intervals), but rather because it is one in account.[463] And this is what gives definition to the movement as before and after.

In this respect too the now follows along in a way with the point. For the point also makes the length continuous and gives it definition, since it is the start of one length and the end of another. But when one takes it in this way, treating the one point as two, one must come to a stop, if the same point is going to be start and end.[464] The now, on the other hand, because what is in spatial movement is in movement, is always a distinct one.

So time is a number, not as being the number of the same point, because it is both start and end, but more as the extremes [are the number] of the line, and not as the parts are—both because of what we said before (for we can treat the middle point as two, so that being at rest will result) and furthermore because it is evident that the now is no part of time, nor the division a part of the movement, any more than the point is a part of the line (on the contrary, it is the two lines that are parts of the one line). Insofar as the now is a limit, then, it is not time, but rather a coincident of it, whereas insofar as it counts, it is a number. For limits belong only to what they are the limits of, whereas the number of these horses (ten) is elsewhere too.

It is evident, therefore, that time is a number belonging to movement with respect to the before and after, and that it is continuous, since what it belongs to is continuous.

IV 12

The smallest number unconditionally is the two.[465] But of a sort of number in a way there is a smallest, in another way not—for example, of a line, the smallest number in plurality is two lines (or one line), but in magnitude there is no smallest, since every line always divides.[466] So it is with time too. For the smallest in number is the one or the two, but in magnitude there is none.

It is evident too that time is not said to be fast or slow, but many or few, and long or short.[467] For insofar as it is continuous, it is long or short, whereas insofar as it is a number it is many or few. But it is not fast or slow. For no number with which we count is fast or slow either.

Also, it is the same time everywhere at once, but not the same time before and after, because the present change is also one, whereas the past change and the future change are distinct.[468] And time is not the number by which we count but the number that is counted, and this, if it occurs before and after, is always distinct, since the nows are distinct. The number of a hundred horses and of a hundred human beings is one and the same, but the things it is a number of are distinct, namely, the horses and the men. Further, in the way that a movement can be one and the same again and again, so too can a time—for example, a year, a spring, or a fall.[469]

Not only do we measure the movement by the time, but also the time by the movement, because they are given definition by each other. For the time gives definition to the movement, since it is its number, and the movement to the time. And we speak of much time and little time, measuring it by the movement, just as we measure the number by what is countable—for example, by the one horse we measure the number of horses. For it is by the number that we know the quantity of horses, and, conversely, by the one horse that we know the number of horses itself. Similarly, in the case of time and movement, since we measure the movement by the time and the time by the movement. And it is reasonable that this has happened, because the movement follows along with the magnitude and the time with the movement, in being a quantity, divisible, and continuous. For it is because the magnitude is like this that the change has these attributes and because movement is like this that time does. And we measure both magnitude by movement and movement by magnitude. For we say that road is long, if the journey is long, and that the latter is long, if the road is long, and that the time is, if the movement is, and the movement, if the time.

Since time is a measure of movement, however, and of being moved, and since it measures a movement by defining some movement that will measure out the whole (just as the cubit measures length by defining some magnitude that will measure out the whole), and for a movement to be in time is for both it and the existence of it to be measured by time (for time at once measures the movement and the existence of the movement), this is what it is for it to be in time, namely, for its existence to be measured; it is clear, though, that for other things too this is what it is to be in time: for their existence to be measured by time.[470]

For to be in time is one or other of two things: [1] to be *when* time is, or [2] in the way that we say of some things that they are *in* number. [2] The latter signifies either what is a part or attribute of number, or in general something that belongs to number, or that there is a number of it. And since time is a number, the now, the before, and everything of this sort are in time in the way in which the unit and the odd and the even are in number (for the latter are something belonging to number, as the former are something belonging to time). Things, by contrast, are in time as they are in number. And if this is so, they are encompassed by time just as things in number are encompassed by number, and things in place by place.

[1] It is evident too that to be in time is not to be when time is, anymore than to be in movement or in place is to be when movement is or when place is. For if this is what being *in something* is to be, then all things will be in anything whatsoever, and the heaven will be in a grain of millet, since when the grain is, so too is the heaven. But this is coincidental, whereas the other follows of necessity, and for what is in time there must be a certain time when that thing is too, and for what is in movement, there must be movement at that time.[471]

Since, though, what is in time is so as in number, a time may be taken that is greater than that of all that is in time, which is why it is necessary for all things in time to be encompassed by time, just like the other things that are in something—for example, the ones in place that are encompassed by place. And a thing is *affected* in some respect by time, just as we are accustomed to say that time dissolves things, that everything grows old due to time, and forgets because of time, but not that it learns because of time, becomes young, or becomes beautiful.[472] For time is intrinsically a cause rather of passing away [than of coming to be], since it is the number of movement, and movement removes what is present.[473]

So it is evident that the things that always are, insofar as they always are, are not in time, since neither are they encompassed by time nor is the existence of them measured by time. A sign of this is that they are not affected by time either, suggesting that they are not in time.

Since time is the measure of movement, however, it will be the measure of rest too, since all rest is in time. For it is not the case that, as everything in movement must move, so it must be too with what is in time. For time is not movement, but a number of movement, and in a number of movement it is also possible for there to be what is at rest. For not everything that is unmoving is at rest, but only what, though lacking movement, is naturally moved, as was said in the previous discussion.[474]

For a thing to be in number is for there to be some number of the thing, and for the existence of it to be measured by the number in which it is, so that if it is time, by time. And time will measure what is moving and what is at rest, insofar as the one is moving and the other is at rest. For it will measure the movement and the rest, saying of what quantity each is. So what is moving, insofar as it is some quantity, will not be measurable by time simply, but insofar as its movement is of some quantity. And so none of the things that are neither in movement nor at rest are in time. For to be in time is to be measured by time, and time is a measure of movement and rest.

It is evident, then, that not every non-being will be in time—for example, all the ones that do not admit of being otherwise, such as the diagonal's being commensurable with the side.[475] For in general, if time is intrinsically a measure of movement and of other things coincidentally, it is clear that the ones whose existence it measures will be all those the being for which lies in being at rest or moving. Those things, then, that admit of passing away and coming to be and in general that at some time are and at some time are not, must be in time, since there will be some greater time that will exceed both their existence and what measures the existence of them.[476] By contrast, non-beings that were (for example, Homer once was) or ones that will be (for example, something in the future) are encompassed by time on whichever of the two sides of the present it encompasses them, and if on both sides, both. But those 222ᵇ1 that it in no way encompasses neither were nor will be. And these are the sorts of non-beings whose opposites always are, as the diagonal's being commensurable always is, and this will not be in time. Nor, therefore, will its being commensurable. That is why it always is not: because it is the contrary of what always is. As for those things where it is not the case that the contrary always is, these are capable of being and of not being, and there is a coming to be and passing away of them.

IV 13

The now is a continuity-maker for time, as has been said, since it makes past and future time continuous.[477] And it is in a general way a limit of time, since it is a starting-point of one time and an end-point of another, although this is not evident, as it is in the case of the point remaining where it is.[478] It divides potentially, and insofar as it does so the now is always a distinct one, whereas insofar as it binds together it is always the same, just as in the case of mathematical lines: for to the understanding it is not always the same point, since it divides in distinct places on distinct occasions; but insofar as it is one, it is the same on all.[479] So too the now is on the one hand a potential divider of time, and on the other the limit and unifier of both segments. But the division and the unification are the same and with respect to the same thing, but their being is not the same.[480]

This, then, is one way in which things are said to be now.[481] Another is when the time of something is near to it: he will come now, because he will come today; he has now come, because he came today. But the events in the *Iliad* have not happened now, nor is the flood now—not that the time is not continuous from now to them, but because they are not near at hand.[482]

And the at some time is defined relative to the first sort of [indivisible] now (for example, at some time Troy was taken, and at some time there will be a flood), since the time must be limited relative to *now*. There will, therefore, be a certain quantity of time from this to that [future one], and there was a certain quantity to the past one. But if there is no time that is not some time, every time will be limited.[483]

Will time, therefore, give out? Or will it not do so, if indeed there is always movement? Will a time, then, always be a distinct one, or the same one many times over? It is clear that time exists in the same way that movement exists. For if one and the same movement comes to be at some time, the time too will be one and the same, and if not, it will not be.[484] But since the now is an end-point and a starting-point of time, but not of the same time, since it is an end-point of past time and a starting-point of future time, then, just as the circle has its convexity and concavity in the same thing in a way, so too time is always at a starting-point and at an end-point. And because of this it seems to be always distinct. For the now is not the starting-point and end-point of the same thing, since otherwise contraries would hold of it at the same time and in the same respect.[485] Time will not give out, then, since it is always at a starting-point.[486]

The just is the part of future time that is close to the present indivisible now: When are you taking a walk? I'm just taking it (because the time in which the person is going to take it is near at hand). Or, it is the part of past time that is not far from the now: when are you taking a walk? I've just taken it. But to say that Troy has just been taken—we do not say that, because it is too far from the now. The recently is the part of the past that is close to the present now: When did you come? Recently (if the time is near to the presently existing now). What is far away from now is long ago. The suddenly is what departed from its former condition in a time that is imperceptible because of its smallness. And all change is from a former condition.[487]

It is in time that all things come to be and pass away. That is why some people called it the wisest of all things, whereas the Pythagorean Paron, speaking more correctly, called it the most ignorant, because people forget in time.[488] It is clear, then, that it will be intrinsically the cause of passing away rather than of coming to be, as was stated earlier (for all change is intrinsically from a former condition), but it is coincidentally a cause of coming to be and of being.[489] An adequate sign of this is that nothing comes to be without its being moved in some way and being affected, whereas a thing may pass away even though it does not move at all. And this above all is what is usually said to be passing away due to time. Nevertheless, time does not produce even this change, although it happens that it too occurs in time.

It has been stated, then, that time exists and what it is, and in how many ways something is said to be now, and what at some time, recently, just, long ago, and suddenly are.

IV 14

With these issues determined by us in this way, it is evident that every change and everything in movement is in time. For the faster and slower exists with respect to every change, since it is seen in every case. By something's "moving faster" I mean that it changes before another into the given condition, when it covers the same distance with a regular movement—for example, in the case of spatial movement, if both things move along the circumference of a circle, or both along a straight line, and similarly in all other cases.[490] But then what is before is in time, since we say before and after with respect to the distance from the now, and the now is the defining mark between the past and the future. So, since the nows are in time, the before and after will also be in time. For the distance from the now will be in what the now is in. (Things, though, are said to be before in contrary ways with respect to past time and future time. For in the past we say that what is before is further from the now, what is after nearer to it, whereas in the future we say that what is before is nearer, and what is after further.) So, since the before is in time, and the before goes along with every movement, it is evident that every change and every movement is in time.

It is also worth investigating how time is related to the soul, and why time seems to be in everything—on earth, in the sea, and in the heaven. Or is it because it is an attribute or state of time, since it is in fact the number of it, and because all these things are movable, since they are all in place, and time and movement are together, both potentially and actively?

One might raise a puzzle, however, as to whether if soul did not exist, time would exist or not. For if it is impossible for there to be something to do the counting, it is also impossible for anything to be countable, so that it is clear that number would not exist either, since a number is either what has been counted or that can be counted. But if there is nothing that has it in its nature to do the counting other than soul, and—of soul—understanding, then it is impossible for time to exist and for soul not to exist, except that there might be that thing (whatever it is) by being which time is [what it is]—for example, if it is possible for movement to exist without soul. The before and after are in a movement, and time is these insofar as they are countable.

One might also raise a puzzle, however, as to what sort of movement time is the number of. Or is it of any sort whatsoever? For things also come to be and pass away, and increase, alter, and spatially move in time. Insofar as each is a movement, then, to this extent time is its number. That is why it is unconditionally the number of continuous movement, and not of a particular sort of it. But [it might be objected] it is possible that now another thing has also moved, with time being the number of each of the two movements.[491] Is there, then, a distinct time, and will there be two equal times at once? Or is this not so? For a time that is both equal and together is the same time, and even those that are not together are the same in species.[492] For suppose there are dogs and horses, seven of each. The number is the same. In the same way, movements that have limits that are together take the same time, although one perhaps is fast and the other not, one a spatial movement and the other an alteration. Yet the time of the alteration and of the spatial movement is the same, if indeed it is the case both that its number is equal and [their limits] together.[493] And this is why, while movements are distinct and separate, time is the same everywhere, because the number belonging to movements that are equal and together is also the same everywhere.

But since there are spatial movements and, among them, circular movement, and each thing is counted by some one thing of the same kind (*genos*), units by a unit, horses by a horse, and in the same way times by some definite time, and since, as we said, time is measured by movement as well as movement by time (and this is so because the quantity of the movement and the time is measured by the movement defined by the time)—if, then, what is first is the measure of all things of the same kind (*genos*), regular circular spatial movement is most of all a measure, because the number of it is most knowable.[494] (Neither alteration, nor increase, nor coming to be are regular, whereas spatial movement is.[495]) That is why time is thought to be the movement of the sphere: because the other movements are measured by this one, and time by this movement.[496]

This is also why the customary saying comes about. For it is said that human affairs go in a circle, as do the other things that have a natural movement and coming to be and passing away. And this is so because all other things are adjudged by time, and get an end and a start as if in accord with a certain temporal cycle. For even time itself is thought to be a sort of circle, and this, in turn, is thought because it is the measure of this sort of spatial movement, and is itself measured by this sort. So that to say that those things that come to be go in a circle is to say that there is a certain circle of time, and this is so because it is measured by the circular spatial movement. For the measured thing appears to be nothing beyond the measure; but the whole universe involves a plurality of measures.[497]

It is also correctly said, however, that the number of the sheep and that of the dogs is the same number, if the two numbers are equal, but they are neither the same ten nor ten of the same things, just as the equilateral and the scalene are not the same triangles, even though they are the same figure, because both are triangles. For things are said to be the same if they do not differ by a differentia, but not if they do.[498] For example, triangle differs from triangle by a differentia of triangle (therefore, they are then distinct triangles), but they do not differ by one of figure, but are in one and the same division of it. For such-and-such sort of figure is a circle, and such-and-such sort a triangle, and, of this, such-and-such sort is equilateral, and such-and-such sort scalene. They are, then, the same figure, and this a triangle, but not the same triangle. Hence, the numbers [we are discussing] are also the same number (for one does not differ from the other by a differentia of number), but is not the same ten, since the things of which it is said differ (for the one lot are dogs and the other lot horses [or sheep]).

We have now spoken about time—both time itself and the topics that properly belong to its investigation.

Book V

V 1

Of all things that change [1] some change coincidentally, as when we say that the musical walks, because something is coincidentally musical, and it walks; [2] others are said unconditionally to change, because something in them changes—for example, those said to change in respect of their parts (for the body becomes healthy, because the eye or the chest does, and these are parts of the whole body); and [3] there is also something that is moved neither coincidentally nor in virtue of something else belonging to it, but is itself moved directly.[499] And this is the intrinsically movable, and the movement is a distinct one in accord with a difference in the sort—for example, alteration. And within the sphere of alteration, curable is distinct from heatable. It is the same way in the case of the mover. For [1] one thing causes movement coincidentally, another [2] in virtue of a part in it, another [3] intrinsically and directly—for example, the doctor cures, and the hand strikes a blow.

There is, then, a thing that causes movement directly; a thing that is moved; further, that in which, the time; and, beyond these, that from which and that to which. For every movement proceeds from something to something, since the thing directly moved is distinct from that to which and that from which it is caused to move—for example, wood, hot, cold, of which the first is the thing, the second, that from which, the third, that to which.[500] It is clear, though, that the movement is in the wood, not in its form.[501] For the form neither causes movement nor is moved, and the place and the quantity do not do so either. On the other hand, there is the mover, the moved, and that to which it is moved. For it is the to which rather than the from which that the change is named after. That is why passing away is a change to non-being, even though what passes away also changes from being, and why coming to be is a change to being, even though it is also a change from non-being.

Now we stated earlier what movement is.[502] But the forms, attributes, and the place to which moving things are moved are immovable—for example, scientific knowledge and heat.[503] And yet one might raise a puzzle as to whether attributes (paleness being an attribute) are movements. But then there will be change to a movement.[504] But presumably it is not paleness that is a movement, but turning pale.[505] And in these cases too there is the coincidental, the in virtue of a part or in virtue of something else, and the directly and not in virtue of anything else. For example, a thing that is turning pale changes coincidentally to a thing being understood (since being understood is coincident with its color); it changes to color, because pale is a part of color (and to being in Europe, because Athens is part of Europe); but it changes intrinsically to the color pale.

It is clear, then, in what way a thing is in movement intrinsically, coincidentally, or in virtue of something else; and—in the case both of the mover and of the moved—in what way in respect of something else and in what way by itself directly; and it is also clear that the movement is not in the form but in the thing that is moving, that is, whose capacity to move is active.[506]

Well, coincidental change we may set aside, since it exists in all things, at all times, and in all respects. Change that is not coincidental, by contrast, is not found in everything, but rather in contraries, their intermediates, and contradictories.[507] We may be convinced of this by induction.[508] Something does change from an intermediate, since it serves as a contrary in relation to either of the two contraries. For the intermediate is in a way the extremes.[509] That is why we speak of it in relation to them, and them in relation to it, as in a way contraries—for example, the middle note is low in relation to the highest and high in relation to the lowest, and gray is light in relation to black and dark in relation to white.

And since every change is from something to something—as the name (*metabolê*) itself makes clear, indicating something after (*meta*) something else, that is, one thing earlier and another later—what changes must change in one of four ways: from an underlying subject to an underlying subject; from an underlying subject to what is not an underlying subject; from what is not an underlying subject to an underlying subject; or from what is not an underlying subject to what is not an underlying subject (I mean by "underlying subject" what is made clear by an affirmation).[510] So it is necessary on the basis of what has been said that there are three sorts of change: that from an underlying subject to an underlying subject; that from an underlying subject to what is not an underlying subject; and that from what is not an underlying subject to an underlying subject. For there is no change from what is not an underlying subject to what is not an underlying subject, because there is no opposition, since the terms are not contraries nor is there any contradiction involved.

A change from what is not an underlying subject to an underlying subject, the relation being that of contradiction, is a coming to be—an unconditional coming to be when the change is unconditional, in a certain respect when the change is in a certain respect. For example, a change from not pale to pale is a coming to be in this respect, pale, whereas a change from unconditionally not being to substance is unconditional coming to be, with respect to which we say that a thing comes to be unconditionally, not that it comes to be something.

A change from an underlying subject to what is not an underlying subject is a passing away—an unconditional one when the change is from substance to not being, in a certain respect when the change is to the opposite contradictory, as was said in the case of coming to be.

Now if things are said in many ways not to be, and there can be movement neither of what by composition or division is not nor of what is potentially, which is the opposite of what unconditionally is actively (for although what is not pale or not good may nonetheless be in movement coincidentally, since what is not pale may be a human, still what is unconditionally not a this cannot in any way be in movement), then it is impossible for what is not to be in movement.[511] And if this is so [it is equally impossible] for coming to be to be a movement. For it is what is not that comes to be [something], since to whatever extent it comes to be [something] coincidentally, it is nonetheless true to say that it belongs to what is not to unconditionally come to be. And it is likewise impossible for what is not to be at rest.

There are these difficulties, then, with what is not being in movement, and another arises if all things that are in movement are in a place and what is not is not in a place.[512] For then it would be somewhere.

Passing away, accordingly, is not a movement either. For the contrary of a movement is either a movement or rest, whereas passing away is the contrary of coming to be.

Since, then, every movement is a sort of change, and changes are the three sorts we mentioned, and since of these coming to be and passing away are not movements, and these are the ones that are with respect to contradictories, it necessarily follows that only change from an underlying subject to an underlying subject is movement. And underlying subjects are either contraries or intermediates (since a lack may be posited as a contrary), and may be made clear by an affirmation (the naked, toothless, or black).[513]

Hence, if the categories are distinguished as being substance, quality, place, time, relation, quantity, and affecting or being affected, it necessarily follows that there are three sorts of movement—that of a quality, that of a quantity, and that with respect to place.[514]

V 2

There is no movement with respect to substance, however, because there is no contrary to substance among the beings.[515] Nor is there with respect to [the category of] relation (for when one of the two relata changes, it may be true that the other does not change at all, so that the movement of them is coincidental).[516] Nor is there movement of affecting or being affected, or of any mover and any moved, because there is no movement of movement nor coming to be of coming to be, nor in general change of change.[517]

For, in the first place, there are just two ways in which there might be movement of movement: [1] As an underlying subject (for example, as a human is in movement because he changes from pale to dark), so that in this way the movement too might be heated or cooled, change its place, increase or decrease. But this is impossible (for a change is not a sort of underlying subject). Or [2] some other underlying subject might change from one change to some other species [of change], like a human does from sick to healthy.[518] But this is not possible either, except coincidentally. For this movement is a change from one species to another.[519] (Coming to be and passing away are also like that, except that they are to things opposed in one way, whereas the other—movement—is to things opposed in another way.[520]) Hence a thing changes at the same time from health to sickness, and from this change itself to another. It is clear, then, that when it has become sick, it will have changed to whatever the other sort of change may be (since it may remain at rest), and furthermore never to some random sort.[521] And this new change will be from something to something else, so that this will in fact be the opposite change: becoming healthy. But [we will respond], this is by coincidence, as there is change from recollecting to forgetting, because what these belong to changes, now to scientific knowledge, now to health.[522]

Further, it will go on without limit, if there is to be change of a change and coming to be of a coming to be. If this is so later, then, it must also be so earlier. For example, if the simple coming to be was at some time coming to be, what comes to be something was also at some time coming to be. So what simply comes to be something was not yet there, but there was already something that was coming to be coming to be something.[523] And again *this* was at some time itself coming to be, and so it was not yet at that time coming to be coming to be. But since in an unlimited series there is no first term, there will be no first here either, and so neither will there be a following one. Nothing, then, can either come to be, move, or change.

Further, the same thing that admits of movement also admits of the contrary movement (and furthermore of coming to rest), and of coming to be and passing away. So what is coming to be coming to be is passing away when it has come to be coming to be. For it cannot pass away as soon as it is coming to be, nor after it has come to be, since what is passing away must *be*.

Further, there must be a matter that underlies both what comes to be and what changes. What then will it be? What is it that becomes a movement or a coming to be, as a body or a soul is what undergoes alteration? And, again, *to what* do they move? For it must be the movement or coming to be *of* something *from* something *to* something.[524] But how will it also *be* at the same time? For learning is not *of* the process of learning, and so no coming to be is of coming to be, and no *this* can be an *of this*, either.[525]

Further, if there are three kinds (*eidos*) of movement, then the underlying nature and that to which it proceeds must be one or other of these—for example, a spatial movement must be altering or in spatial movement.[526]

In general, then, since everything is moved in one of three ways, either coincidentally, in virtue of a part of it, or intrinsically, change can change only coincidentally, as when the one being cured runs or learns. And coincidental change we set aside just now.[527]

Since there is no movement either of substance or of relation or of affecting and being affected, it remains for movement to be with respect to quality, quantity, and place. For in each of these there is contrariety. Movement with respect to quality we may call alteration, since it is has been joined to this common name. By quality I mean not what is in the substance (for even the differentia is a quality), but the affective quality in virtue of which a thing is said to be capable of being affected or to be unaffectable.[528] Movement with respect to quantity, as regards its common feature, has no name, but with regard to each of its two varieties it is called increase and decrease—that to the complete magnitude being increase, that away from it being decrease. Movement with respect to place has neither a common nor a special name, but we may call the common sort spatial movement, even though things are said to be spatially moving in the strict sense only when, without its being up to them to have stayed where they were, they change their place, as are things that do not move themselves with respect to place.

Change within the same species but with respect to the more and the less is alteration, since it is movement from a contrary to a contrary, whether unconditionally or to some degree.[529] For when it proceeds to the less, it will be said to be changing to the contrary, and when to the more, from the contrary to the attribute itself. For it makes no difference whether the changing is to some degree or unconditional, except that in the former case the contraries will have to be present only more or less. And the more and the less is the presence or absence of a greater or lesser degree of the contrary [of the attribute].

On the basis of these considerations, then, it is clear that there are [only] these three sorts of movements.

A thing is immovable either [1] when it is wholly incapable of being moved (in the way that a sound is invisible), or [2] when it is moved scarcely at all in a long time or is slow in starting to be moved, that is, when it is said to be difficult to move; or [3] when it is naturally moved and is capable of being so but is not moved either when, where, or how it should in accord with its nature be moved. Of the immovables, the last is the only one I describe as just being at rest. For rest is contrary to movement, so that it must be a lack in what is receptive of movement.[530]

It is evident from what has been said, then, what movement is, what rest is, and how many sorts of changes and what sorts of movements there are.

V 3

We next proceed to say what together [or coincident] and separate are, what making contact [or touching] is, and what intermediate, successive, contiguous, and continuous are, and to what sorts of things each of these naturally belongs.

Things are said to be together in place when they are in one first place, to be separate when they are in distinct ones, and to be making contact [or touching] when their extremities are together in place.[531]

Since all change is between opposites, however, and these are either contraries or contradictories, and there is no middle term between contradictories, clearly what is intermediate is between contraries. Thus an intermediate involves at least three things. For in a process of change it is the contrary that is the ultimate thing. And an intermediate is what a changing thing—if it changes continuously—arrives at prior to arriving at the ultimate thing to which, in accord with its nature, it is changing.[532] And something is moving continuously if it leaves no intervals, or leaves the smallest interval, in the thing—not in the time (for an interval in the time does not prevent this, and on the other hand immediately after the lowest note the highest note may sound) but in the thing in which the movement takes place.[533] This is evident in changes with respect to place as well as in other sorts of changes. And to be contrary in place is to be most distant along a straight line. For the shortest line is limited, and what is limited is a measure.

A thing is successive when it is after the starting-point in position, in form, or in some other definite way and when there is nothing of the same kind (*genos*) between it and what it succeeds—I mean, for example, lines in the case of line, units in that of unit, or houses in that of house (but there is nothing to prevent something of some other kind from being in between). For what is successive is successive of something and is something posterior. For one does not succeed two, nor the first day of the month the second, but the other way around.

What are contiguous are what are successive and making contact. {227^{a}7–10}[534] Continuity is just a sort of contiguity. I mean that two things are continuous when the limits of each by which they make contact become one and the same thing and are, as the name signifies, contained in each other. But continuity is impossible if these extremities are two. From this definition it is evident that the continuous is found in those things that by nature become one in virtue of their making contact. And in whatever way what holds them together is one, so too will the whole be one—for example, by being nailed together, by being glued together, by contact, or by natural assimilation.[535]

It is also evident that the successive is primary. For things that make contact are necessarily successive, but not all things that are successive make contact. That is why succession is found in things, such as numbers, that are prior in account, whereas contact is not. And if there is continuity there is necessarily contact, whereas if there is contact, there need not be continuity. For the extremities of things need not be one if their extremities are together, while if they are one, they must also be together. So a natural unity is last in coming to be. For the extremities must make contact if they are to be naturally unified. But things that are making contact are not all naturally unified, and in things where there is no contact, in these it is clear that there is no natural unity either.

So if, as some people say, there is a point and a unit that exist separately, it is impossible for unit and point to be the same, since in points there is contact, whereas in units there is only succession.[536] Also, whereas it is possible for there to be something intermediate between points (for all lines are intermediate between points), between units there need not be, since there can be nothing intermediate between two and one.[537]

It has now been stated what together and separate are, what making contact is, what intermediate and successive are, what contiguous and 227b1 continuous are, and the sorts of things each of these belongs to.

V 4

A movement is said to be one in many ways, since we say that things are one in many ways.[538] A movement is one in genus in accord with the figures of predication (for any spatial movement is one in genus with any other spatial movement), whereas alteration is distinct in genus from spatial movement.[539] It is one in species when it is one in genus and is in an indivisible species.[540] For example, there are differentiae of color (therefore turning dark and turning pale are distinct in species—though at all events every turning pale will be the same in species with every other turning pale and every turning dark with every other turning dark), whereas of paleness there are not.[541] That is why any turning pale is one in species with any other turning pale. If, however, there is a genus that is at the same time a species, it is clear that the movement will then in a way be one in species, but will not be unconditionally one in species—for example, learning, if scientific knowledge is a species of supposition, and genus of the sciences.[542]

One might raise a puzzle, though, as to whether the movement is one in species, when the same thing changes from the same to the same—for example, when one point changes again and again from a particular place to a particular place. If it is, then circular spatial movement and rectilinear spatial movement will be the same in species, as will rolling and walking. But was it not determined that the movement is distinct in species if what it occurs in is distinct in species, and are not the circular and the rectilinear distinct in species? In genus, then, and in species, a movement is one in this way.

A movement is unconditionally one, on the other hand, when it is one in substance and in number. And what sort of movement this is will be clear from the following distinctions. For there are three things that we speak of in connection with movement: [1] the thing, [2] what it is in, and [3] when.[543] I mean that there must be something that is in movement (for example, a human or gold), and it must be moving in something (for example, in a place or in an attribute), and at some time, since all movement occurs in time. Of these three, being one in genus or in species depends on the thing in which the movement occurs being one, being contiguous in the time, whereas being unconditionally one depends on being one in all three. And indeed that in which (the species) must be one and indivisible, and the when (the time) must be one and without intermission, and what is in movement must be one, but neither coincidentally so (like the pale turning dark or Coriscus walking—Coriscus and the pale are one, but coincidentally) nor in virtue of something common (for two human beings might be being cured at the same time with the same curative process, for example, from inflammation of the eye, yet this movement is not [unconditionally] one, but one in species). As for Socrates undergoing an alteration that is the same in species at one time and then again at another, if it is possible for what passed away to come to be again while remaining one in number, then this alteration will also be one, if not, it will be the same in species but not one.[544]

There is another puzzle quite similar to this, as to whether health, and in general the states and attributes of bodies, are one in substance, since the things that have them are evidently in movement and flux. If, accordingly, a person's health at daybreak and his health now are one and the same, why should it not also be one and the same as the health he recovers after an interval? In fact, the same argument applies to states and activities, except for this difference, that if [the states] are two, it follows because of this that the activities must also be two in number (for an activity that is one in number belongs to a state that is one in number), whereas if the state is one, presumably this would seem not yet to be enough for the activity also to be one, since when someone stops walking, the walking no longer exists, but when he is walking again, it will exist again.[545] In any case, if the state or activity is one and the same, it must be possible for what is one and the same to pass away and exist many times over.[546] The puzzles, however, lie outside our present investigation.

Since, though, every movement is continuous, a movement that is unconditionally one must (if indeed every movement is divisible) be continuous, and a continuous movement must be one.[547] For not every movement could be continuous with every other movement, any more than a random thing can be continuous with any other random thing, but rather those in which the extremities are one. Now some things have no extremities at all, while those of others are distinct in species and are homonyms.[548] For how could the extremity of a line and of taking a walk make contact and become one? Movements that are not the same in species or in genus may, it is true, be consecutive (for after running someone might immediately fall ill with a fever), and in a torch-race, for example, we have successive but not continuous spatial movement.[549] For what are continuous was posited to be those things whose extremities are one.[550] So movements are contiguous and successive in virtue of the time being continuous, but there can be

continuity only in virtue of the movements themselves being continuous,
and this is when extremities of both become one.[551] That is why
228b1 it is necessary for a movement that is unconditionally continuous and
one to be the same in species, of one thing, and in one time. In one
time, in order that there may be no intermediate interval of immobility.
For during such an interval there must be rest, and a movement is
many and not one if it includes an intermediate interval of rest, so that
5 if a movement is divided by a stop, it is neither one nor continuous;
and it is divided, if there is an intermediate interval of [rest] time. Of a
movement that is not one in species (even if the time is not intermittent),
although the time is one, the movement is distinct in species,
[and so is not one]. For a movement that is one must be one in species,
though it is not necessary for a movement that is one in species to be
10 unconditionally one. What is it for a movement to be unconditionally
one has now been stated.

Further, a movement is also said to be one when it is complete,
whether in genus, in species, or in substance, and, just as in the other
cases, completeness and wholeness belong to what is one. Sometimes,
though, even an incomplete movement is said to be one, but only if it
is continuous.

Further, a movement is said to be one in a way distinct from those
15 just mentioned when it is regular.[552] An irregular movement seems in
a way not to be one movement, while a regular one does seem so, as a
rectilinear one does.[553] For an irregular one is divisible. The difference,
though, would seem to be one of the more and less.[554] In the case of
every sort of movement, however, it may proceed regularly or not. For
a thing may alter in a regular way, and move spatially in a regular path
20 (for example, in a circle or in a straight line), and it is the same with
regard to increase and decrease. And irregularity is sometimes a differentiation
(*diaphora*) in the path of the movement (for a movement
cannot be regular if its path is an irregular magnitude—for example, a
broken line, a spiral, or any other magnitude that is not such that any
25 random part fits on to any other random part).[555] Sometimes, though,
it lies neither in the place nor in the time nor in that to which, but in
the manner, since sometimes the movement is differentiated by fastness
and slowness.[556] For if its speed remains the same, it is regular,
but if it does not, it is irregular. That is why fast and slow are neither
species nor differentiae of movement, because they follow along with
all movements, [including] the ones that differ in species.[557] So heaviness
30 and lightness, when they are toward the same thing, are not species
or differentiae either—for example, of earth in relation to itself, or
of fire in relation to itself.[558] Irregular movement, then, while it is one

in virtue of being continuous, is less so, just as is the case with spatial movement in a broken line. And what is less so always involves an admixture of the contrary.[559] But if every movement that is one admits of being both regular and irregular, movements that are contiguous but not the same in species cannot be one and continuous. For how could a movement composed of an alteration and a spatial movement be regular? For if a movement is to be regular it must fit together.[560]

V 5

Further, we must determine what sorts of movements are contrary to each other, and the same way with rest.[561] And we must determine first whether contrary movements are: [1] from the same thing and to the same thing (for example, one from health and one to health), as coming to be and passing away seem to be; [2] from contraries (for example, one from health and one from disease); [3] to contraries (for example, one to health and one to disease); [4] from a contrary to its contrary (for example, one from health and one to disease); or [5] from a contrary to its contrary and from the latter contrary to the former (for example, one from health to disease and one from disease to health). For movements must be contrary to each other in one or more of these ways, since there is no other way in which they can be opposed.

Now [4] movements from a contrary to its contrary (for example, one from health and one to disease) are not contrary movements, since they are one and the same. Yet the being for them is not the same, just as changing from health is not the same as changing to disease.[562] Nor are [2] movements from a contrary and from *its* contrary contrary movements. For a movement from a contrary is at the same time a movement to a contrary or to an intermediate (but about this we shall speak later).[563] Besides, changing to a contrary rather than from a contrary would seem to be a cause of the contrariety of movements, since the latter is the loss, the former the gain, of contrariety. Also, each movement is said to be what it changes to rather than what it changes from—for example, movement to health we call becoming healthy, movement to disease becoming sick.[564]

We are left, then, with [3] movements to contraries and [5] movements from contraries to their contraries.[565] Now perhaps it happens that [3] movements to contraries are at the same time movements from contraries, although presumably their being is not the same (I mean that being a movement to health from disease is not the same as being one from health to disease).

Since, though, a change differs from a movement (for movement is change from an underlying subject to an underlying subject), it follows that [5] contrary movements are movements from a contrary to its contrary and from the latter contrary to the former—for example, one from health to disease and one from disease to health. But it is clear from induction what sorts of things seem to be contraries. For becoming sick seems contrary to becoming healthy, and learning to being led (not through one's own agency) into error, since these are to their contraries—for, as with scientific knowledge, it is possible to acquire error either through one's own agency or through that of another.[566] Also, upward spatial movement and downward spatial movement (for these seem to be contraries with respect to length), that to the right and that to the left (for these seem to be contraries with respect to breadth), and forward and backward (for these too are contraries).[567]

As for what is only *to* a contrary, it is not a movement but a change—for example, becoming pale but not from something.[568] And in those cases in which there is no contrary, it is the change from the same thing and the one to the same thing that are contraries. That is why coming to be is contrary to passing away, and losing to gaining.[569] These are changes, but they are not movements.

And in the case of those movements where there is an intermediate, movements to it must be posited as in a way to a contrary. For the intermediate serves as a contrary for the movement, in whichever direction the change may be—for example, one from gray to white is in a way from black, one from white to gray is in a way to black, and one from black to gray is in a way to white. For in relation to each contrary the intermediate is said to be in a way the other contrary, as was said earlier.[570]

One movement is contrary to another movement, then, in the following way: when one is from a contrary to its contrary and the other is from the latter contrary to the former.

V 6

Since, though, movement seems to have as a contrary not only movement but also rest, we must make some determinations about this. For, unconditionally, a movement is contrary to a movement, whereas rest is in fact opposed to it (for it is lack of movement, and the lack of something too is in a way said to be its contrary), and rest of a sort to movement of that sort—for example, rest with respect to place to movement with respect to place.[571] But this, as the case stands, is said too unconditionally. For is it movement from it or movement to it that is opposed to remaining at a particular place?

It is surely clear that since movement involves two underlying subjects, what remaining at one of these is opposed to is the movement from it to its contrary, while what remaining at its contrary is opposed to is movement from that to it.[572] At the same time, these two are also contrary to each other.[573] For it would be absurd if there were contrary movements, but there were not opposed states of rest. But these are in contraries—for example, rest in health is contrary to rest in disease. (It is also opposed to the movement from health to disease. For it would be absurd for it to be opposed to the movement from disease to health, since movement to what a thing is at rest in is rather a coming to rest—at any rate, it happens at the same time as the movement. But it must be either this movement or the other one.) For rest in *paleness* is not contrary to rest in health.

But for things that have no contraries, of which there are contrary changes, the one from the thing and the one to the thing (for example, from non-being to being), which is not a movement, there is no remaining as or where they are, although there is absence of change.[574] And if there is some underlying subject, absence of change in its being would be contrary to absence of change in its non-being. But if there is not something that is in a state of non-being, one might raise a puzzle as to what it is that is contrary to absence of change in a thing's being, and whether it is rest. If it is, then either not every state of rest is contrary to a movement or else coming to be and passing away are movements. It is clear, therefore, that we must not say that this absence of change is a state of rest, if these are not movements, but that it is similar to it and is absence of change. And its contrary is either nothing at all, absence of change in the thing's non-being, or the passing away of the thing. For its passing away is change from it and its coming to be is change to it.

One might raise a puzzle, though, as to why it is that while in the case of a change with respect to place both remaining in it and moving may be in accord with nature or contrary to it, in the others this is not so. For example, alteration is in some cases in accord with nature and in others contrary to nature (for becoming healthy is no more in accord with nature or contrary to nature than becoming sick, nor turning pale than turning dark). Similarly in the case of increase and decrease. For these are not contrary to each other in the sense that one is by nature and the other contrary to nature, nor is one increase contrary to another in this sense. And the same account applies in the case of coming to be and passing away. For it is not the case that coming to be is in accord with nature and passing away contrary to nature (for growing old is in accord with nature), nor, in coming to be, do we see one case in accord with nature and in another contrary to nature.

Or if what is by force is contrary to nature, is passing away by force contrary to nature and as such contrary to passing away in accord with nature? Are there, therefore, also some comings to be that are by force and not allotted, which are as such contrary to those that are in accord with nature, as well as increases and decreases by force—for example, the rapid growth to maturity due to nourishment, and the rapid ripening of seeds, even when not closed up?[575] And how is it in the case of alterations? Or is it the same? For some might be by force, while others are natural—for example, those patients who get rid of their fever not during the days of the crisis and those who do so during the days of the crisis; the first lot alter contrary to nature, the second in accord with nature. But, it may be objected, we shall then have passings away that are contrary to each other, not to comings to be. And what exactly is there to prevent their being in a way so? As it is in fact if one is pleasant and the other painful. So one passing away will be contrary to another not unconditionally, but insofar as one is of *this* sort and the other of *that* sort.[576]

Well, in general movements and states of rest are contraries in the way we just described—for example, movement upward and rest up above are contrary to movement downward and rest down below. For up and down are contraries belonging to place. And as for the spatial movements, the one that is by nature upward is that of fire, the one by nature downward is that of earth, and the spatial movements of *these* are contraries. In the case of fire, spatial movement upward is by nature, while the one downward is contrary to nature. And the one that is in accord with nature for it is certainly contrary to the one that is contrary to nature. And states of remaining are similar. For remaining up above is contrary to movement from it downward, and to earth this remaining occurs against nature and this movement in accord with nature. So the remaining that is contrary to the nature of a thing is contrary to the movement that is in accord with its nature, since its movement contrary to its nature is likewise contrary to it. For one of its movements will be in accord with nature, the upward or the downward, the other contrary to nature.

There is a puzzle, though, as to whether there is a coming to be of every state of rest that is not eternal, and if it is a coming to a stop. If so, then there must be a coming to be of what is remaining contrary to nature—for example, a coming to be of earth's remaining up above. And therefore at the time that it was by force in spatial movement upward it was coming to a stop. But what is coming to a stop seems to be in spatial movement that is always faster, whereas with what is in spatial movement by force it seems to be the contrary. Without coming to be at rest, therefore, it will be at rest.[577] Further, a thing's coming to a stop seems to be wholly the same as its being in spatial movement to its own place, or to occur at the same time as it.

There is also a puzzle as to whether remaining in a particular place is contrary to movement from that place. For when a thing is in the process of moving from this and leaving it behind, what it is leaving behind still seems to belong to it, so that if a state of rest is itself contrary
to the process of moving from there to its contrary, then contraries 30
will belong to the thing at the same time. But is the thing at rest only *in a way* if it still remains as or where it was? And in general is part of the thing that is in movement in that initial place, while part is at the one to which it is changing? That is why what is contrary to a movement
is a movement rather than a being at rest.[578] 231^{a}1

Concerning movement and rest, then, we have stated in what way each is one and which ones are contrary to which.

One might also raise a question, however, about coming to a stop,
as to whether in the case of movements that are contrary to nature too 5
there are opposed states of rest. Well, it would be absurd if this were not so. For a thing may remain as or where it is by force (so that there would be something in a non-eternal state of rest without having come to be in it). But it is clear that this will be so. For just as a thing may be in movement contrary to nature, so too it may be at rest contrary to nature. And since in the case of some things there is movement in
accord with nature and contrary to nature (for example, in the case of 10
fire upward movement is in accord with nature, whereas downward movement is contrary to nature), is it the latter movement that is contrary to the former one or earth's downward movement (for it spatially moves downward in accord with nature)? Or is it clear that both are, but not in the same way? Instead, earth's downward movement is contrary to fire's upward movement as one movement that is in accord with nature is contrary to another movement that is in accord with nature, whereas fire's upward movement is contrary to its downward movement as a movement in accord with nature is contrary to a movement
contrary to nature. Similarly, in the case of a thing's remaining as 15
or where it is. But presumably a movement is also opposed in a way to a state of rest.[579]

Book VI

VI 1

If continuity, making contact, and successive are defined as above, with things being continuous if their extremities are one, making contact if their extremities are together, and successive if there is nothing of the same kind (*genos*) intermediate between them, then a continuous thing cannot be composed of indivisibles—for example, a line of points, if indeed a line is continuous and a point indivisible.[580] For the extremities of a point can neither be one (since there can be no extremity of an indivisible thing as distinct from some other part) nor together (for what has no parts can have no extremities, since the extremity and what it is an extremity of are distinct).

Further, if what is continuous is composed of points, these points must be either continuous or making contact with each other: and the same argument applies in the case of all indivisibles. Now they certainly cannot be continuous because of the argument just stated.[581] On the other hand, when one thing makes contact with another either whole makes contact with whole, part with part, or part with whole. But since what is indivisible is without parts, they must make contact as whole with whole. But if they make contact as whole with whole, there will not be a continuous thing. For what is continuous has distinct parts, and may be divided into these, which are then distinct in this way, that is, separated by place.

But then a point cannot succeed a point either, or a now a now, so that a length is composed of points or a time of nows. For things are successive if there is nothing of their own kind (*genos*) intermediate between them, whereas what is intermediate between points is always a line, and between nows an interval of time.

Further, each of the two could be divided into indivisibles, if indeed it is divisible into the parts of which it is composed. But no divisible thing, as we saw, is divisible into things without parts. Nor can there be anything of any other kind (*genos*) that is intermediate, since it will be either indivisible or divisible, and if divisible, either into indivisibles or into things that are always divisible, in which case it will be continuous.

But it is evident too that everything that is continuous is divisible into things that are always divisible. For if it will be divisible into indivisibles, there will be an indivisible making contact with an indivisible, since the extremities of things that are continuous with each other are one and make contact.

The same argument applies to magnitude, time, and movement: either all of these are composed of indivisibles and are divisible into indivisibles, or none are. This is clear from the following. For if a magnitude is composed of indivisibles, the movement along that magnitude will also be composed of an equal number of indivisible movements—for example, if the magnitude ABC is composed of the indivisibles A, B, C, each corresponding part of the movement DEF of O traversing ABC is indivisible. If, then, where there is movement there must be something in movement, and where there is something in movement there must be movement, then what is being moved will also be composed of indivisibles. Well then O traversed A with the movement D, B with the movement E, and similarly C with the movement F. Now what is in movement from one place to another cannot at the same time be moving and have moved to where it was moving when it was moving (for example, if someone is taking a walk to Thebes, he cannot at the same time be taking a walk to Thebes and have taken a walk to Thebes).[582] And, as we saw, O traverses A, which is without parts, in virtue of the presence of movement D. So if O passed through A after being in the process of traversing it, then its movement must be divisible. For at the time O was in the process of traversing, it was neither at rest nor had passed through but was intermediate. On the other hand, if at the same time O is traversing and has traversed, then what is taking a walk will, at the time it is taking a walk, have taken the walk, and will be there—that is, it will have moved to the place to which it was moving. And if a thing is traversing the whole of ABC, and its movement is the movements D, E, and F, and if it is not in movement at all in A, which is without parts, but has moved in it, then its movement will not be composed of movements but of jumps, that is, it will occur in virtue of a thing's having moved without being in movement, since it has traversed A without traversing it.[583] So it will be possible for a thing to have taken a walk without ever walking, since it will have taken a walk in A without taking a walk in it. If, then, everything must be either at rest or in movement, and O is at rest in each of A, B, and C, it follows that a thing can be continuously at rest and at the same time in movement. For, as we saw, O is in movement in the whole of ABC and at rest in any part of it, and so in the whole. Also, if the indivisibles that compose DEF are movements, it would be possible for a thing in which movement is present not to be in movement but at rest, whereas if they are not movements, it would be possible for a movement not to be composed of movements.

And if length and movement are indivisible, it is likewise necessary for time too to be so, that is, to be composed of indivisible nows. For if every length is divisible, and what is travelling with equal speed will traverse a smaller one in less time, then the time will be divisible too. And if the time in which a thing is in spatial movement through A is divisible, A will be divisible too.

VI 2

Since every magnitude is divisible into magnitudes (for we have shown that it is impossible for anything that is continuous to be composed of indivisibles, and every magnitude is continuous), it necessarily follows that the faster of two things traverses a greater magnitude in an equal time, an equal magnitude in less time, and a greater magnitude in less time, which is just the way faster is defined by some thinkers.[584] For let A be faster than B. Accordingly, since, of two things, the one that changes earlier is faster, in the time t_{1-4} in which A has changed from P_1 to P_2, B will not yet have arrived at P_2 but will fall short of it at P_3. [Fig. 1]

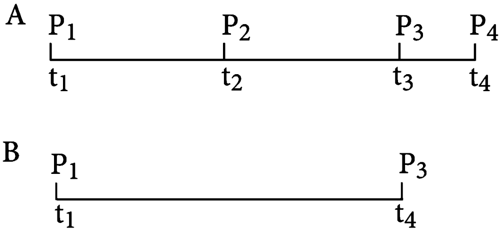


Fig. 1

So in an equal time A will traverse a greater magnitude. More than this, it will traverse a greater one in less time. For in the time it takes A to arrive at P_4, B, being the slower, has arrived at P_3. Then, since A takes the whole time t_{1-4} to arrive at P_4, it will have arrived at P_3 in less time than that, let us say in t_{1-3}. Now the magnitude P_{1-4} traversed by A is greater than the magnitude P_{1-3}, and the time t_{1-3} is less than the whole time t_{1-4}. So A traverses a greater magnitude in less time.

It is also evident from this that the faster will traverse an equal magnitude in less time than the slower. For since it traverses a greater magnitude in less time than the slower, and since taken by itself it traverses a greater magnitude (for example, P_{1-3}) in more time than it does a lesser (for example, P_{1-2}), the time t_{1-3} in which it traverses P_{1-3} will be more than the time t_{1-2} in which it traverses P_{1-2}. So, if the time t_{1-3} is less than the time t_{1-4} taken by the slower to traverse P_{1-3}, the time t_{1-2} will also be less than the time t_{1-4}. For t_{1-2} is less than t_{1-3}, and what is less than what is less than a thing is itself less than it. So, the faster will traverse an equal magnitude in less time than the slower.

Further, since everything must move in a time that is equal to, less than, or more than that of anything else, and that of the slower is more, that of what is of equal speed equal, and since the faster is neither of equal speed nor slower, then what is faster will move in a time that is neither equal nor more. It remains, then, that it moves in less time. So it is necessary again that the faster traverse an equal magnitude in less time than the slower.

Since every movement is in time and every time is one in which something can move, and since everything that is in movement may be moving faster or slower, in every time there may be faster or slower movement. This being so, it is also necessary for time to be continuous. By continuous I mean what is divisible into things that are always divisible. For if this is what continuity is assumed to be, then time must be continuous. For since it has been shown that the faster will traverse an equal magnitude in less time than the slower, let A be faster and B slower, and let the slower traverse the magnitude P_{1-3} in time t_{1-3}. [Fig. 2] It is clear, accordingly, that the faster will traverse the same magnitude in less time than this. And let it have moved in t_{1-2}.

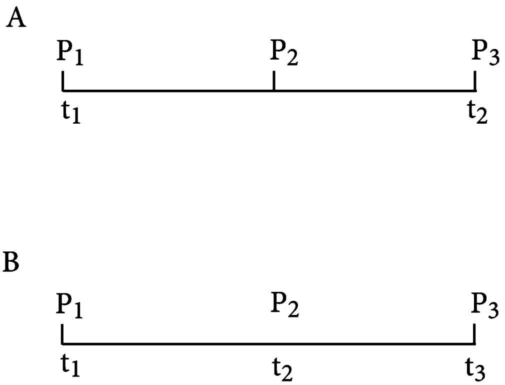


Fig. 2

Again, since the faster has traversed the whole of P_{1-3} in time t_{1-2}, the slower will in the same time traverse a lesser magnitude, and let this be P_{1-2}. And since B, the slower, has traversed P_{1-2} in the time t_{1-2}, the faster will traverse it in less time, so that the time t_{1-2} will again be divided. And if it is divided, the magnitude P_{1-2} will also be divided, and in the same ratio.[585] But if the magnitude is divided, so too is the time. And this will always be so if we take the slower after the faster and the faster after the slower, and make use of the same demonstration at each stage. For the faster will divide the time and the slower the length. If, then, this conversion always holds true, and at every turn of the conversion there is a division, it is evident that all time must be continuous.[586] And at the same time it is clear that every magnitude is also continuous. For time and magnitude are divided by divisions that are the same and equal.

Further, it is evident on the basis of the accounts that are customarily stated that if indeed time is continuous, magnitude is continuous too, if indeed in half the time a thing traverses half the distance, and, putting it unconditionally, if in less time it traverses less. For the divisions of the time and of the magnitude will be the same. And if either one of these is unlimited, so is the other, and the one is unlimited in the same way as the other, and the other as the one—for example, if time is unlimited with respect to its extremities, length too is so with respect its extremities; if with respect to division, length too is so with respect to division; and if with respect to both, magnitude is so with respect to both.[587]

That is why Zeno's argument is false when it assumes that it is impossible to traverse unlimited things or to touch unlimited things each by each in a limited time.[588] For there are two ways in which length, time, and in general anything continuous are said to be unlimited: with respect to division or with respect to their extremities. Therefore, while it is not possible in a limited time to make contact with things that are unlimited in quantity, it is possible if they are unlimited with respect to division. For time itself is unlimited in this way. So it is in an unlimited time and not in a limited one that traversing the unlimited takes place, and contact with things that are unlimited is made by unlimited times, not by limited ones.

Neither, indeed, can an unlimited magnitude be traversed in a limited time, nor a limited one in an unlimited time. Instead, if the time is unlimited, the magnitude will also be unlimited, and if the magnitude is unlimited, the time will be too. For let AB be a limited magnitude, t_u an unlimited time, and let a limited interval t_{1-2} of the time t_u be taken. Now in this interval a thing will traverse a certain segment of the magnitude, and let BE be the segment thus traversed. And this will either measure AB exactly, fall short of it, or exceed it.[589] It makes no difference, in fact, which it is. For if a magnitude that is equal to BE will always be traversed in an equal time, and BE measures the whole magnitude AB, then the whole time taken to traverse AB will be limited. For it will be divided into equal [parts] as the magnitude also is.[590] 233b1

Further, if not every magnitude is traversed in an unlimited time, but it is possible to traverse some magnitude—for example, BE—in a limited time, and if this BE measures the whole of which it is a part, and if an equal magnitude is traversed in an equal time, it follows that the time is limited as well. And it is evident that AB will not be traversed in an unlimited time, if the time is taken to be limited in one of the two directions.[591] For as a part of AB is traversed in less time than the whole, this time must be limited, since a limit—at any rate in one direction—exists. And if the length is unlimited and the time limited, the demonstration will be the same.

It is evident, then, from what has been said that neither a line, a plane, nor in general anything continuous can be indivisible, not only because of what has just been said, but also because otherwise the indivisible will turn out to be divisible. For since in every interval of time there may be faster and slower movement, and the faster traverses a greater length in an equal time, it is possible for it to traverse a length that is twice, or one and a half times, as great as that traversed by the slower, since this may be the ratio of their respective speeds.[592] Let the faster, then, traverse in the same time a magnitude that is one and a half times that traversed by the slower, and let the magnitude traversed by the faster be divided into three indivisible parts AB, BC, and CD, and that traversed by the slower into the two EF and FG. Accordingly, the time t will also be divisible into three indivisible parts, since an equal magnitude will be traversed in an equal time. Now let the time t be divided into t_{1-2}, t_{2-3}, and t_{3-4}. Again, since the slower has traversed EF and FG, the time will also be divided into two. [Fig. 3]

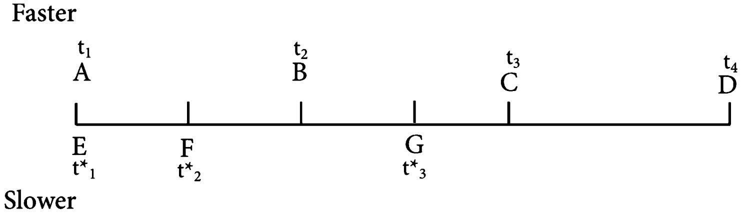


Fig. 3

Hence the indivisible [for example, AB, t_{1-2}] will be divided [for example, at F, t^*_2], and what is without parts will be traversed not in an indivisible but in a greater time.[593]

It is evident, then, that nothing continuous is without parts.

VI 3

The now too—said not with reference to something else, but intrinsic and primary—is necessarily indivisible, and as such is present in every interval of time.[594] For there is an extremity of the past (no part of the future lying on this side of it), and again one of the future (no part of the past lying on the other side of it). It, then, we have said, is a limit of both.[595] And if it is shown to be such intrinsically and [for the two limits] to be the same, it will at once also be evident that it is indivisible.[596]

It is necessary, therefore, for the now that is the extremity of both times to be the same. For if they were distinct, the one could not be successive with the other, because nothing continuous can be composed of things without parts, whereas if the one is separate from the other, there will be a time intermediate between them. For everything continuous is such that there is something synonymous intermediate between its limits.[597] But then if the intermediate thing is time, it will be divisible. For all time has been shown to be indivisible.[598] So the now will be divisible. But if the now is divisible, some part of the past will be in the future and some part of the future in the past, since that at which it would be divided is what will determine what is past and what is future time.[599] At the same time, the now would not be something intrinsic, but with reference to something else, since the division will not be intrinsic.[600] In addition, part of the now will be in the past and part in the future, and it will not always be the same one that is past or future. Indeed, the now will not be the same either, since the time is divisible at many points.[601] So if these features cannot belong to the now, the same now must be in each of the two times it divides. But then if it is the same, it is evident that it is also indivisible. For if it is divisible, once again the same things will follow as before.

It is clear from what has been said, therefore, that there is something in time that is indivisible, and this we say is the now.

And that nothing is in movement in the now is evident from the following. For if this is possible, then it is possible for there to be faster and slower movement in the now. Accordingly, let N be the now, and let the faster have moved a distance AC in it. Then the slower will in the same now move a distance less than AC—let it be AB. But since the slower moved the distance AB in the whole now N, the faster will move it in less time, so that the now N will be divided. There is not, then, anything that is in movement in the now.

Moreover, nothing is at rest in the now either. For what is at rest, we have said, is what naturally moves but is not in movement when, where, or in the way it would naturally be so.[602] So, since nothing is naturally in movement in the now, it is clear that nothing is at rest in it either.

Further, if the now is the same in both of the times it divides, and it is possible for a thing to be in movement throughout the whole of one time and at rest throughout the whole of the other, and if what is in movement throughout the whole of a time will be in movement in any part of it in which it is naturally in movement, and what is at rest will likewise be at rest, then it follows that the same thing is at the same time at rest and in movement. For both the times have the same extremity: the now.

Further, we say that a thing is at rest when it and its parts are in the same state now as previously. But in the now there is no previously, so there is no being at rest either.

Both the movement of what is in movement, therefore, and the being at rest of what is at rest must be in time.

VI 4

Also, everything that is changing must be divisible. For since every change is from something to something, and when a thing is in what it has changed to it is no longer changing, and when both it itself and all its parts are in what it changes from it is not changing (for what keeps in the same state, both itself and its parts, is not changing), it is necessary that part of what is changing must be in what it is changing from and part in what it is changing to (for it cannot be in both or in neither of the two).[603] By "what it is changing to" I mean the first one with respect to the change—for example, gray not black, if it is changing from white. For it is not necessary for what is changing to be at either of the extremes. It is evident, then, that everything that is changing will be divisible.

Movement, though, is divisible in two ways. One way is with respect to the time, another is with respect to the movements of the parts of what is in movement—for example, if the whole AC is in movement, its parts AB and BC will also be in movement. Accordingly, let the movement of the parts be M_{1-2} of AB and M_{2-3} of BC. It is necessary, then, for the whole M_{1-3} to be the movement of AC. For it will be in movement with respect to these parts, if indeed each of its parts is moving with its respective movement. And nothing is in movement with respect to the movement of something other than by its parts being in movement. So the whole movement is the movement of the whole magnitude.

Further, if every movement is the movement of something, and the whole movement M_{1-3} is neither the movement of either of the parts (for of the parts it is the respective parts of the movement) nor of anything other than them (for a whole movement is of a whole thing, and the parts of the parts, and the parts of M_{1-3} are of the parts of AC and of no other thing, since, as we saw, a movement that is one cannot be the movement of more than one thing), then the whole movement will be that of the magnitude of ABC.[604]

Further, if the movement of the whole is something other than M_{1-3}, for example, M_{x-z}, the movements of each of its parts may be subtracted from it. And these will be equal to M_{1-2} and M_{2-3}. For the movement of what is one is one. So if the whole M_{x-z} is divided into the movements of the parts, M_{x-z} will be equal M_{1-3}. On the other hand, if there is a remainder, for example, M_{y-z}, this will be a movement of nothing. For it can be the movement neither of the whole nor of the parts (because the movement of what is one is one) nor of anything other than them, since a movement that is continuous must be of things that are continuous. It is the same way if there is an excess M_{z-w} with respect to the division.[605] So, if this is impossible, it is necessary for M_{x-z} to be the same as and equal to M_{1-3}.

This, then, is what division of movement with respect to the movement of the parts is. And it must be applicable to everything that is divisible into parts.

Another division is with respect to time. For since every movement is in time, and all time is divisible, and in less time the movement is less, it is necessary for every movement to be divisible with respect to time. And since everything that is in movement is in movement in a certain respect and for a certain time and the movement is of the entire thing, it is necessary for there to be the same divisions of [1] the time, [2] the movement, [3] the being-in-movement, [4] the thing that is in movement, and [5] what the movement is with respect to (although the divisions of what the movement is with respect to are not all alike, rather those of quantity are intrinsic, those of quality coincidental).[606]

[1] For let the time in which a thing is in movement be t and the movement M_{1-3}. If, then, in all the time t the thing completed the whole movement M_{1-3}, in half the time it completed less of it, and, if this time is divided, less of it again, and so on always in the same way. Similarly, if the movement is divisible, the time will also be divisible.

For if the whole movement is in all the time, the half is in half the time, and less again in less of it.

[3] And the being-in-movement is also divisible in the same way. For let B_{1-3} be the whole being-in-movement. The being-in-movement, then, that corresponds to half the movement M_{1-3} will be less than the whole B_{1-3}, and the one that corresponds to half of the half will be less again, and so on always in the same way. And by setting out the beings-in-movement corresponding to each of the two movements, for example, corresponding to M_{1-2} and M_{2-3}, we may also say that the whole being-in-movement B_{1-3} will be that with respect to the whole movement M_{1-3}.[607] For if some other being-in-movement does so, more than one being-in-movement will correspond to the same movement—[which can be shown] in the same way as we showed that the movement of a thing is divisible into the movements of its parts.[608] For if we take the beings-in-movement B_{1-2} and B_{2-3} as corresponding to each of the two movements M_{1-2} and M_{2-3}, the whole B_{1-3} will be continuous.[609]

[5] The divisibility of the length will also be shown in the same way, as in general will be that of everything with respect to which there is change (although some of these are coincidentally divisible, because the thing that is changing is so), since when one is divided all will be divided. So too in the issue of their being limited or unlimited, they will all alike be either one or the other. And in most cases the fact that all the things we looked at were divisible or unlimited followed along with the fact that the thing that is changing is so, since divisibility and unlimitedness belong directly to the thing that is changing. That divisibility does so was shown earlier; that unlimitedness does so will be made clear in what follows.[610]

VI 5

Since everything that changes changes from something to something, it is necessary for what has changed, at the moment when it has first changed, to be in what it has changed to. For what is changing gives up possession of and leaves behind what it is changing from, and leaving behind and changing are either the same or leaving behind follows along with changing. And if leaving behind follows along with changing, having left behind follows along with having changed, since in each pair there is a similar relation between its two members.

Since, then, one sort of the change is with respect to contradiction, when a thing has changed from non-being to being, it has left non-being behind.[611] Hence it will be in being. For everything must either be or not be. It is evident, then, that in change with respect to contradiction what has changed must be in what it has changed to. And if this holds in this sort of change, it will also hold in the others.[612] For what holds in the case of one sort, holds also in that of the others.

Further, if we take each sort separately it is also evident that this is so, if indeed what has changed must be somewhere or in something.[613] For since it has left behind what it has changed from and must be somewhere, it will be either in what it has changed to or in something other than it. If, then, what has changed to C is in something other than C, for example, B, then it is changing again from B to C. For B was not contiguous to C, since the change is continuous.[614] So what has changed, at the moment when it has changed, is changing to what it is changing to. But this is impossible.[615] Hence what has changed must be in what it has changed to. It is also evident, then, that what has come to be, at the moment when it has come to be, will *be*, and that what has passed away will *not be*. For what we have said applies universally to every sort of change, and is most of all clear in that with respect to contradiction. It is clear, accordingly, that what has changed, at the moment when it has first changed, is in what it has changed to.

Now the primary time in which what has changed has changed must be indivisible.[616] By "primary" I mean that it is not in virtue of some other thing belonging to it that the thing is such as it has changed to. For let the time AC be divisible, and let it be divided at B. If, then, the thing has changed in AB or again in BC, AC cannot be the primary time in which it has changed. If on the other hand it were changing in each (for it must either have changed or be changing in each of them), it would also be changing in the whole AC. But it *has changed* in AC. The argument is the same even if the thing is changing in one part and has changed in the other, since then there will be something prior to what is primary.[617] So the time in which the thing has changed must be indivisible. It is also evident, then, that the time in which what has passed away has passed away or in which what has come to be has come to be is indivisible.

But something is said to be "the primary time in which a thing has changed" in two ways: [1] when it is the primary one in which the change has been completed (for then it is true to say that it has changed); [2] when it is the primary one in which the changing started. Now what is said to be "primary" with reference to [1] the end of the change does really exist. For a change admits of being completed, and there is an end of change, and *it* we have shown to be indivisible because it is a limit.[618] But what is said to be "primary" [2] with reference to the starting-point does not exist at all. For there is no starting-point of a change nor a primary part of the time in which a thing started to change.[619] For let BC be a primary part. It is certainly not indivisible, since otherwise the nows would be contiguous.[620] Further, if the thing is at rest in all of the time AB [immediately preceding BC] (for let it be posited that it is at rest), it is also at rest in B. So if BC is without parts, the thing will be at rest and have changed at the same time. For it is at rest in B and has changed in C. But, since BC is not without parts, it must be divisible, and the thing must have changed in any part of it whatsoever. For if it has changed in neither of the two parts that BC is divided into, it has not changed in the whole of it either; and if it is changing in both, it is also changing in all of it; and if it has changed in one of the two, it has not changed in the whole primarily.[621] So it must have changed in any part of it whatsoever. It is evident, therefore, that there is no primary time in which it has changed, since the divisions of BC are unlimited.

Of what has changed, there is also no primary part that has changed. For let the primary part of DF that has changed be DE (for every changing thing has been shown to be divisible).[622] And let the time in which DE has changed be t_{1-2}. If, then, DE has changed in the whole time, in the half what has changed will be less than and so prior to DE, and there will be another part again that is prior to this, and so on always in the same way.[623] So of what has changed there will be no primary part that has changed.

It is evident, then, from what has been said that there is no primary part either of what changes or of the time in which it changes.

As for the thing itself that changes—or [better] what a thing changes with respect to—the situation is no longer similar. For three things are **236b1** mentioned with regard to change: what changes, what it changes in, and what it changes to—for example, the human being, the time, and the pale.[624] Now the human being and the time are divisible, but where the pale is concerned it is another story (although all are *coincidentally* divisible, since what the pale or the quality coincides with is divisible), since of those that are said to be *intrinsically* and not coincidentally divisible there will be no primary part that changes—for example, there will be none in the magnitudes. For let AC be a magnitude, and let it have moved from A to a primary point B.[625] Then if AB is indivisible, a thing without parts will be contiguous to a thing without parts, whereas if it is divisible, there will be something prior to B to which the magnitude has changed, and something else again prior to that, and so on always in the same way, because the process of division can never come to an end.[626] So there will be no primary one to which it has changed. It is likewise in the case of quantitative change as well. For here too the change is in something continuous.

It is evident, then, that only in movement with respect to quality can there be intrinsic indivisibility.[627]

VI 6

Since, though, everything that changes changes in time, and is said to be changing in time both as changing in a primary time and as doing so with respect to another time (for example, when we say that it changes in a particular year because it changes in a particular day of it), if what changes is changing in a primary time, it must be changing in any part of it whatsoever. This is clear even from the definition (for "primary" was meant in this way), but it is also evident from the following.[628] Let the primary time in which what is in movement is in movement be AC, and (since all time is divisible) let it be divided at B. Now in the time AB the thing either is in movement or is not in movement, and likewise in the time BC. If, then, it is in movement in neither of the two, it will be at rest in the whole (for to be in movement in it when in movement in none of its parts is impossible). If on the other hand it is in movement in only one of the two, then AC cannot be the primary time in which it is in movement, since its movement will be with respect to a time other than AC. It must, therefore, be in movement in any part whatsoever of AC.

Now that this has been shown, it is evident that everything that is in movement must have been in movement previously. For if in the primary time AC the thing has traversed the magnitude M_{1-2}, then in half that time a thing that is moving with the same speed and that started its movement at the same time will have traversed half of it. But if this second thing, which is traveling at the same speed, has traversed a certain magnitude in a certain time, the first thing must have traversed the same magnitude in the same time, so that what is in movement must have been in movement previously.

Further, if we say that a thing has moved in all the time AC—either in the whole of it or in any part whatsoever—by taking its extreme now (for it is this that defines it, and what is intermediate between nows is time), it would likewise be said to have moved in the others. But the extremity of the half is a division. So the thing will have moved both in half the time and in general in any part of it whatsoever. For as soon as any division is made there is always a time defined by the nows. If, then, all time is divisible, and what is intermediate between nows is time, everything that is changing must have changed an unlimited number of times.

Further, if what is changing continuously, without having passed away or having ceased changing, must have been changing or have changed in any part of the time whatsoever, and since it cannot *be changing* in a now, it must *have changed* in each of the nows. So if the nows are unlimited in number, everything that is changing will have changed an unlimited number of times.

And not only must what is changing have changed, but what has changed must also previously have been changing. For everything that has changed from something to something has changed in an interval of time. For let a thing have changed from A to B in a now. Then the now in which it has changed cannot be the same as the one in which it is in A (since otherwise it would be in A and B at the same time). For we have shown previously that what has changed, at the moment when it has changed, is not in what it has changed from.[629] But if it is in another now, there will be an interval of time intermediate between the two. For, as we saw, nows are not contiguous.[630] Since, then, it has changed in an interval of time, and all time is divisible, in half that interval it must have made another change, and in half the half another again, and so on always in the same way, so that it must have been changing previously.

Further, what has been said is more evident in the case of magnitude, because the magnitude in which what is changing changes is continuous. For let a thing have changed from C to D. Then if CD is indivisible, a thing without parts will be contiguous to a thing without parts. But, since this is impossible, what is intermediate between them must be a magnitude and must be divisible without limit into magnitudes. So it must previously have been changing to the latter. Hence everything that has changed must previously have been changing. For the same demonstration also applies to what is not continuous—for example, in the case of contraries and in that of contradictories. For the time in which the thing has changed may be taken, and then we may state the same argument again. So what has changed must have been changing and what is changing must have changed, and there will be a having changed previous to a changing, and a changing previous to a having changed, and at no time can one be taken as primary. And the cause of this is that no thing without parts can be contiguous to a thing without parts. For the division is without limit, just as in increasing and decreasing lines.[631]

It is also evident, then, that what has come to be must previously have been coming to be, and that what is coming to be must previously have come to be (that is, the ones that are divisible and continuous), although it is not always of what the thing is coming to be that this holds, but sometimes it is something else, for example, some part of it, like the foundation of a house.[632] Likewise in the case of what is passing away and what has passed away. For in what comes to be and in what passes away something unlimited is immediately present precisely because they are continuous. And a thing can neither be coming to be without having come to be nor have come to be without coming to be, and likewise too in the case of passing away and having passed away. For having passed away is always previous to passing away, and passing away to having passed away.

It is evident, then, that what has come to be must previously have been coming to be, and that what is coming to be must previously have come to be. For every magnitude and every interval of time is divisible without limit.

So in whatever [time or magnitude] a thing may be, it cannot be in it as in a primary one.

VI 7

Since, though, everything in movement is moving in time, and in a longer time covers a greater magnitude, it cannot cover a limited magnitude in an unlimited time, if it is not always moving in the same movement and in some iteration of it, but rather covers all of the magnitude in all of the time.[633]

It is clear that if a thing is moving with equal speed, it must cover a limited magnitude in a limited time. For if a part is taken that will measure the whole, the thing will have covered the whole magnitude in as many equal intervals as there are parts of the movement. So since the parts are limited, both each individually in magnitude and all collectively in number, the whole time will also be limited. For it will be so-and-so many times so-and-so much, equal to the time of a part multiplied by the number of the parts.

And if the speed is not equal it makes no difference. For let AC be a finite extension which the thing has traversed in an unlimited time, and let the unlimited time be t_{1-n}. If, then, one part of the extension must have been covered before another part (and this is clear, because in the earlier and in the later part of the time a distinct part has been covered, since in a longer time a distinct part will always have been covered, whether the thing changes with equal speed or not with equal speed, and whether the speed of the movement increases, diminishes, or remains the same, this is no less so), let us then take AB, a part of the extension AC, that will measure AC. This part, then, was traversed in a certain limited part of the unlimited time. For it cannot be in an unlimited one, since the whole movement AC took an unlimited one. And if I again then take a distinct part equal to AB, it too must have been traversed in a limited time, since it was the whole movement 10 that took an unlimited one. And if I go on taking parts in this way, then, since no part of what is unlimited will measure what is unlimited (for the unlimited cannot be composed of a limited number of parts, whether equal or unequal, because equal or unequal parts that are limited in number and magnitude will be measured by some one unit, and so, whether they are equal or unequal, will nonetheless be definite 15 in magnitude), and since the limited extension AC is measured by so-and-so many times AB, AB would be traversed in a limited time. And it is the same way with coming to rest.[634] So it is impossible for one and the same thing to be always coming to be or always passing away.[635]

The same argument will also show that in a limited time there cannot 20 be either unlimited moving or unlimited coming to rest, whether a regular one or an irregular one. For if a certain part is taken that will measure the whole time, in it some quantity of the magnitude will be traversed and not the whole (for the whole will be traversed in all of the time), and again in another equal part another quantity, and likewise in each part, whether equal or unequal to the one at the start (for this 25 makes no difference, provided only that each is limited). For it is clear that when the time is exhausted, the unlimited magnitude will not be, since the process of subtraction is limited both in quantity subtracted and in number of subtractions. So the unlimited magnitude will not be traversed in a limited time. And it makes no difference whether the magnitude is unlimited in one of the two directions or in both, since 30 the argument will be the same.

These things having been demonstrated, it is evident that neither can a limited magnitude traverse an unlimited magnitude in a limited time, due to the same cause.[636] For in part of the time it will traverse a limited magnitude, and in each part it will do likewise, so that in the whole time it will traverse a limited magnitude. 35

And since a limited magnitude will not traverse an unlimited one in a limited time, it is clear that neither will an unlimited one traverse a limited one. For if the unlimited one can traverse the limited one, the 238^{b}1 limited one must also traverse the unlimited one.[637] For it makes no difference which of the two is the one in movement, since either way the limited traverses the unlimited. For when the unlimited magnitude A is in movement a part of it—for example, CD—will traverse the limited 5 magnitude B, and then another, and then another, and so on always in the same way. So the unlimited magnitude A will have traversed the limited magnitude B at the same time as the limited magnitude B will have traversed the unlimited A. For presumably there is no other way possible for the unlimited one to have traversed the limited one than by the limited one traversing the unlimited one, either by being in spatial movement over it or by measuring it. So, since this is impossible, the unlimited one cannot traverse the limited one.

But then neither does the unlimited one traverse the unlimited one in a limited time. For if it traverses the unlimited one, it will also traverse the limited one, since the limited one is contained in the unlimited one.

Further, by taking the time, the demonstration will be the same.[638]

Since in a limited time, then, the limited one does not traverse the unlimited one, nor the unlimited the limited, nor the unlimited the unlimited, it is evident that neither will there be unlimited movement in a limited time. For what difference does it make whether it is the movement or the magnitude that we posit as being unlimited? For if either of the two is unlimited, the other must be so as well, since all spatial movement is in a place.

VI 8

Since everything that is either naturally in movement or naturally at rest is so when, where, and in the way that is natural, what is coming to a stop, when it is coming to a stop, must be in movement. For if it is not in movement, it is at rest, but it is not possible for what is at rest to be coming to be at rest. This having been demonstrated, it is also evident that coming to a stop must be in time. For the movement of what is in movement is in time, and what is coming to a stop was shown to be in movement, so it is necessary for coming to a stop to be in time. Further, what we say is faster or slower is in time, and coming to a stop may be faster or slower.

And what is coming to a stop must be coming to a stop in any part whatsoever of the primary time in which it is coming to a stop. For if it is coming to a stop in neither of the two parts that the time may be divided into, it will not be doing so in the whole time either, so that what is coming to a stop will not be coming to a stop. On the other hand, if it is coming to a stop in only one of the two parts, then the whole will not be the primary time in which it is coming to a stop, since it will be coming to a stop with respect to something else—as we also stated previously in the case of what is in movement.[639]

And just as there is no primary time in which what is in movement is in movement, so too there is not one in which what is coming to a stop is coming to a stop. For neither in the case of being in movement nor in that of coming to a stop is there a primary one. For let AB be the primary time in which a thing is coming to a stop. Then AB cannot be without parts. For there is no movement in what is without parts, because part of it has to have moved, and what is coming to a stop has been shown to be in movement.[640] But then if AB is divisible, the thing is coming to a stop in any part of it whatsoever. For we have shown previously that it is coming to a stop in any part whatsoever of the primary time in which it is coming to a stop.[641] Since, then, what a thing is primarily coming to a stop in must be an interval of time, and not something indivisible, and since all time is divisible without limit, there cannot be any primary interval in which it is coming to a stop.

Nor, then, can there be a primary time in which what is at rest has come to be at rest. For it cannot have come to be at rest in what is without parts, because there cannot be movement in what is indivisible, and in that time in which there is being at rest there can also be being in movement. For something is at rest, we said, if it can be naturally in movement but is not in movement when—that is, in that time in which—it is natural.[642] Further, we also say that a thing is at rest when it is in the same state now as previously, as discerned not by one point but by at least two.[643] So what a thing is at rest in cannot be without parts. But if it is divisible into parts, it would be an interval of time, and the thing will be at rest in any part of it whatsoever. For this can be shown in the same way as in the previous cases.[644]

So there will be no primary interval of time. And the cause of this is that everything that is at rest and everything that is in movement is in time, and there is no time, magnitude, or in general continuous thing that is primary. For all of them are divisible without limit into parts.

And since everything that is in movement is in movement in time and changes from something to something, in that time in which it is moving intrinsically, not by doing so in some part of it, it is impossible for it then to be in movement with respect to some particular thing primarily.[645] For to be at rest is for a thing and each of its parts to be in the same state in the same time. For this is the way we speak of a thing as being at rest: when at one now after another both it and its parts can truly be said to be in the same state. But if this is what being at rest is, it is impossible for what is changing as a whole to be doing so with respect to some particular thing in its primary time. For all the time is divisible, so that in one part of it after another it will be true to say that the thing itself and its parts are in the same state. For if it is not so in this way, but only at one now, then the thing will be the same in some certain respect not for an interval of time but in [a now that is] the limit of that time. But though in a now it is always the same with respect to something that remains unchanged, it is not at rest.[646] For the thing is neither in movement nor at rest in a now. And, though it is true that it is not in movement in a now and is so with respect to a particular thing, it cannot in an interval of time be so with respect to what is at rest, since it then follows that what is in spatial movement is at rest.[647]

VI 9

Zeno, though, argues fallaciously. For he says that if everything is always at rest when it is so with regard to what is equal [to itself], and what is in movement is always like that in a now, then an arrow that is in spatial movement is unmoving.[648] But this is false. For time is not composed of indivisible nows any more than any other magnitude is composed of indivisibles.

Zeno's arguments about movement, which present difficulties to those trying to resolve them, are four in number:[649]

[1] The first states that there is no movement because what is in spatial movement must arrive at the halfway point before it arrives at the end. We went through it previously.[650]

[2] The second is the so-called Achilles. It is as follows. The slowest runner in a race will never be overtaken by the fastest. For the pursuer must first reach the point from which the former started, so that the slower must always be a bit ahead. This argument is in effect the same as [1] that from bisection, though it differs from it in not dividing in half the additional magnitude being taken. The conclusion of the argument, then, is that the slower is not overtaken, but it is reached in the same way as by dichotomy (for in both cases what follows is that the limit is not reached when the magnitude is divided in a certain way, although there is the additional conclusion in [2] that even the famously fastest runner will fail to catch the slowest one), so that the resolution must be the same.[651] And the claim that what is a bit ahead is never overtaken is false. For though at the time it is a bit ahead it is not overtaken, nonetheless it is overtaken if indeed it is granted that it is possible to traverse the limited distance in question.[652]

These, then, are two of the arguments. [3] The third, stated just now, is that an arrow in spatial movement is at rest.[653] This results from assuming that time is composed of nows, since if this is not granted there will be no deduction.

The fourth argument concerns two rows of bodies in a stadium that are equal in size to each other in opposite directions, one lot starting from the end, the other from the middle, and both moving at equal speed, from which it follows, he thinks, that half of a time is equal to its double.[654] The fallacy in this lies in the claim that a thing in spatial movement with an equal speed takes an equal time to pass a moving body as to pass a body of an equal size that is at rest. But this is false. For example, let A_1, A_2, A_3, A_4 be the bodies of equal volume that are at rest, B_1, B_2, B_3, B_4 the bodies that start from the middle, being equal in number and size to the As, and C_1, C_2, C_3, C_4 the bodies that start from the end of the stadium, being equal in number and size to the As, the speed of which is equal to that of the Bs. [Fig. 1] **240ᵃ1**

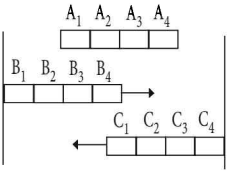


Fig. 1

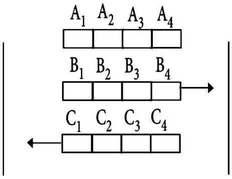


Fig. 2

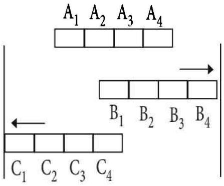


Fig. 3

The results, then, will be as follows: First, as the Bs and the Cs pass each other, B_1 will reach C_4 at the same time as C_1 will reach B_4. [Fig. 2] It follows that C_1 has passed all the Bs but only half the As while B_1 has passed half that number of As.[655] So the time taken by B_1 is half that of C_1, since each of the two takes the same time to pass each body. At the same time it follows that B_1 has passed all the Cs. For C_1 and B_1 will be at opposite extremes of the As at the same time, because both B_1 and C_1 are for an equal time alongside each A. [Fig. 3] The argument, then, is as above, but it proceeds from the falsehood mentioned.[656]

Nor with regard to change to a contradictory will there be anything impossible for us to face—for example, from the argument that if a thing is changing from not white to white but is neither one nor the other, it is therefore neither white nor not white.[657] For if a thing is not wholly in either of the two states, it does not follow that it will not be said to be white or not white. For we say that a thing is white or not white not when the whole of it is such, but when most of its parts or its most-controlling parts are: not being in a state is not the same as not being wholly in it.[658] The same holds in the case of being and in the case of not being, and of other pairs of contradictories. For while a thing will of necessity be in one or the other of the opposites, it is never wholly in one or wholly in the other.

And this is so again in the case of the circle and the sphere and in general of what is in movement within [the place occupied by] itself, and it is argued that it follows that they are at rest, since each of them

and its parts will be in the same place for any interval of time, and so will be at rest and in movement at the same time. But first the parts are not in fact in the same place for any interval of time, and
240b1 second the whole is also always changing to another place. For the circumference taken from point A is not the same as the one taken from point B, C, or from each of the other points—except in the way that the human and the musical human are the same: because they coincide.[659] [Fig. 4]

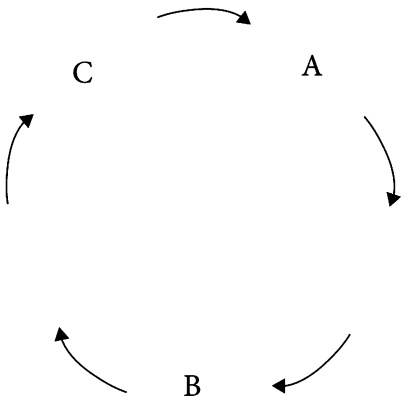


Fig. 4

So the circle is always changing from one [place to another], and
5 will never be at rest. And it is the same way in the case of the sphere and in that of whatever else is in movement within [the place occupied by] itself.

VI 10

Having demonstrated these things, we are now in a position to state that what is without parts cannot be in movement except coincidentally—for example, by the movement of the body or magnitude in
10 which it is present, just as what is in a boat may be in movement due to the spatial movement of the boat, or as a part will be in movement due to that of the whole. By "without parts" I mean what is indivisible with respect to quantity. For even the intrinsic movements of the parts are distinct from the movements of the parts with respect to the whole.[660]

The distinction may be seen most clearly in the case of a [revolving] sphere. For the speeds of parts near the center, of those near the surface, and of the whole sphere are not the same, implying that their movements are not one.

As we have said, then, what is without parts can be in movement in the way that a man sitting in a boat is in movement when the boat is traveling, but it cannot be so intrinsically. For let it be changing from AB to BC, whether from a magnitude to a magnitude, from a form to a form, or with respect to a contradiction. And let t_p be the primary time in which it is changing. Then in the time in which it is changing it must be in AB or BC or partly in one and partly in the other, since this, as we saw, is true of everything that is changing.[661] Now it will not be partly in each of the two, since then it would be divisible into parts. But then neither will it be in BC, since then it will have changed, whereas it is assumed to be changing. It remains, then, that it is in AB in the time t_p in which it is changing. Hence it will be at rest. For, as we saw, to be in the same state for an interval of time is to be at rest.[662]

So it is not possible for what is without parts to be in movement or in general changing. For there is only one way in which such movement would be possible for it, namely, if time was composed of nows, since then in every now it would have moved and changed, so that it would at no time be moving, but at every time have moved. But that this is impossible was already shown previously.[663] For time is not composed of nows, nor a line of points, nor a movement of jumps.[664] For someone who states this that it is possible for what is without parts to be in movement does nothing other than make movement out of things without parts, just as he makes time out of nows, and length out of points.

Further, it is also evident from the following that neither a point nor any other indivisible thing can be in movement. For whatever is in movement cannot traverse a line greater than itself without previously traversing one that is equal to or less than itself. If, then, this is so, it is evident that a point too must first traverse one equal to or less than itself. But since a point is indivisible, it cannot previously traverse one less than itself. It must, therefore, traverse one equal to itself. So the line will be composed of points, for as at every time the point traverses something equal to itself it will measure out the whole line. But if this is impossible, it is also impossible for what is indivisible to be in movement.

Further, if everything in movement is in movement in time, but nothing is in movement in a now, and if all time is divisible, then for everything in movement there would be a time less than that in which it traverses a part as great as itself. (For that in which it is thus in movement will be a time, because everything in movement is so in time, and it was shown previously that all time is divisible.[665]) If, therefore, a point is in movement, there must be a certain time less than that in which the point itself has moved.[666] But this is impossible, since in less time it must traverse less. So what is indivisible will be divisible into something less than itself, just as the time is into intervals of time. For there is only one way in which what has no parts and is indivisible would be in movement, namely, if it could be in movement in a now that is indivisible. For the same argument is involved in being in movement in the now as in an indivisible thing being in movement.

No change, though, is unlimited. For every change, whether between contradictories or between contraries, is from something to something. So in changes with respect to contradiction, the affirmation or the denial is the limit—for example, in coming to be it is being, in passing away it is not being. And in those between contraries it is the contraries that are the limit. For these are the extremities of the change, and so of all alteration (for alteration is always from certain contraries).[667]

It is likewise with increase and decrease. For the limit of increase is the complete magnitude that is in accord with the nature proper to what is increasing, while the limit of decrease is the complete departure from this.

Spatial movement on the other hand is not limited in this way, since it is not always between contraries. But since what is incapable of being cut (I mean, in the sense that it does not admit of *being* cut; for something is said to be incapable in many ways)—what is incapable of being cut in this sense does not admit of *being* cut, and in general what is incapable of coming to be does not admit of *coming* to be, and what is incapable of changing does not admit of *changing* to what it is incapable of changing to.[668] If, then, what is in spatial movement is changing to something, it will have the capacity to have changed to it. So its movement is not unlimited, nor will it be in spatial movement over an unlimited distance, since it cannot traverse it.

It is evident, then, that no change is unlimited in this way: in not being defined by limits. But whether one and the same change is so in the following way, namely, so as to unlimited in time or not should be investigated.[669] For if the change is not one presumably nothing prevents this—for example, if a spatial movement is followed by an alteration, this by an increase, and this again by a coming to be. For in this way there will be forever a movement in time, but not one movement, because there is not one that is composed of all these. So if it is to be one, no movement admits of being unlimited in time except one: if it is spatial movement in a circle.

Book VII[670]

VII 1

Everything that is in movement must be moved by something. For if it does not have a starting-point of movement within itself, it is evident that it is moved by something else (for what causes the movement will be some other thing). But if it does have the starting-point within itself, let AB be what is in movement intrinsically and not because some part of it is in movement. First, then, to assume that AC, because it is in movement as a whole and is moved by nothing external to itself, is therefore moved by itself is just like denying that DEF is moved by something else when DE moves EF and is itself in movement, because it is not evident which is the part that is moving it and which the part that is moved. Second, what is not in movement due to something else does not necessarily cease being in movement because something else is at rest, but if a thing is at rest due to something else's having ceased moving, then it must be in movement due to something else. But if this is accepted, everything that is in movement must be moved by something. For, since AB has been taken to be in movement, it must be divisible (for everything in movement is divisible). Let it be divided, then, at C. Then when AB is not in movement, CB will not be in movement. For if it will be in movement, it is clear that AC would be in movement when CB is at rest, so that AC will not be in movement intrinsically and primarily. But it was assumed to be in movement intrinsically and primarily. Therefore, if CB is not in movement, AB must be at rest. But it was agreed that what is at rest if something else is not in movement must be moved by something. So everything that is in movement must be moved by something. For what is in movement will always be divisible, and if a part of it is not in movement the whole too must be at rest.

Since everything that is in movement must be moved by something, if it should happen that a thing that is in movement in place is moved by something else that is in movement, and the latter is moved by something else again that is in movement, and that one by something else, and so on always in the same way, it is necessary for there to be some primary mover, and the series does not go on without limit. For let this not be so, but instead let it go on without limit, and let A be moved by B, B by C, C by D, and always the next one by the next one. Then since by hypothesis the mover while moving something is also itself in movement, and the movement of the moved and the movement of the mover must occur at the same time (for the mover is moving the moved and the moved is being moved at the same time), it is evident, then, that the movement of A, of B, of C, and of each of the moved movers will occur at the same time. Let, then, each movement be taken, and let the movement of A be M_1, the movement of B be M_2, and those of C and D be M_3 and M_4. For if it is always the case that each is moved by another, yet we may still take the movement of each as being one in number. For every movement is from something to something, and is not unlimited with respect to its extremities. And by a "movement that is one in number" I mean, of course, a movement that proceeds from something numerically the same to something numerically the same in numerically the same time. For a movement may be the same in genus, in species, or in number: in genus, if it belongs to the same category—for example substance or quality; in species, if it proceeds from something the same in species to something the same in species—for example, from pale to dark, or from a good to a bad that are not different in species; and in number, if it proceeds from something numerically one to something numerically one in the same time—for example, from *this* pale to *this* dark, or from *this* place to *this* place, in *this* time (for if in another time, it will no longer be one in number, but in species).[671] But these issues were discussed earlier.[672]

And let the time in which A has moved also be taken, and let it be t. Since the movement of A is limited the time will also be limited. Since, then, the movers and the things in movement are unlimited, the movement $M_1M_2M_3M_4$, that is, the movement composed of all of them, will be unlimited. For the movements of A, B, and the others may be equal, or the movements of the others may be greater. So whether they are equal or greater, in both cases the whole movement is unlimited (for we are assuming what admits of being so to be so).[673] And since the movement of A and that of each of the others occur at the same time, the whole movement will occur at the same time as that of A. But that of A is limited. So there would be an unlimited movement in a limited time, which is impossible.[674]

It might thus seem that what we set out to show at the start has been shown, but it has not been demonstrated, because nothing impossible has been shown. For in a limited time there can be unlimited movement, although not of one thing but of many. And this is just what happens in the case of these things [A, B, C, D, and so on]. For each of these is being moved with its own movement, and for many things to be moving at the same time is not impossible. But if what in a primary

way causes movement with respect to place and with a bodily movement must either be in contact with or be continuous with what is 60
moved, as we see to be so in all cases, then the things moved and the
movers must be continuous with or in contact with each other, so that
one thing is composed of all of them.[675] And whether this thing is limited or unlimited makes no difference to cases before us now, since in
all cases the movement will be unlimited when the things are unlimited, if indeed the movements of the things admit of being either equal 65
to or greater than each other, since we are taking what admits of being
so to actually be so.[676] If, then, what is composed of ABCD is a thing
that is either limited or unlimited and is moved with the movement
$M_1M_2M_3M_4$ in the limited time t, it follows that in a limited time either
what is limited or what is unlimited goes through an unlimited movement, which in both cases is impossible.[677] So the series must come to 70
a stop, and there must be a first mover and a first moved. For it makes
no difference that the impossibility follows from a hypothesis, since
the hypothesis that was taken is something that admits of being so, and
when what admits of being so is posited nothing impossible should **243ᵃ30**
come about because of it.[678]

VII 2

The primary mover, not as the for-the-sake-of-which but as the
starting-point from which the movement proceeds, is always together
with what is moved by it (by "together" I mean that nothing is intermediate between them).[679] For this is something common to every moved
and mover. And since there are three sorts of movements, with respect 35
to place, with respect to quality, and with respect to quantity, there
must also be three sorts of movers: one that causes spatial movement,
one that causes alteration, and one that causes increase or decrease.
First, then, we should speak about spatial movement, since it is the
primary sort of movement.

Everything, then, that is in spatial movement is moved either by 11
itself or by something else. In the case of things that are moved by themselves it is evident that the moved and the mover are together, since the
primary mover is within the things themselves, so that there is nothing intermediate in between. As for those that are moved by something
else, this must occur in four ways, since spatial movements caused by 15
other things are of four species: pulling, pushing, carrying, and rotating. For all movements with respect to place are led back to these.

For pushing along is a sort of pushing in which what is moving
something away from itself follows it and continues to push it, whereas

pushing away is when it does not follow what it has moved. Throwing
20 is when the mover produces a movement away from itself that is
243b1 more violent than the spatial movement that is in accord with nature,
and in which the thing would continue to be carried for as long as the
imparted movement is in control. Again, pushing apart and pushing
together are sorts of pushing and pulling. For pushing apart is a sort of
pushing away (since the pushing away is either from the pusher itself
or from something else), while pushing together is a sort of pulling (for
the pulling may be toward the puller itself as well as toward something
5 else).

So too with the other species of these, such as packing and combing,
since the former is a sort of pushing together, the latter a sort of
pushing apart.[680] And the same is true of the other sorts of aggregation
and disaggregation (for they will all be found to be sorts of pushing
apart or pushing together), except for the ones that are involved in
coming to be and passing away.[681] (At the same time it is evident that
10 there is no other genus of movements but aggregation and disaggregation,
since they are all divided into the ones mentioned.[682]) Further,
inhaling is a sort of pulling, exhaling a sort of pushing. And the same
is true of spitting and of all other movements that occur through the
body, whether excretions or assimilations. For the latter are pullings,
the former pushings away.

But the other sorts of movement with respect to place must also be
15 led back to the four species, since they all fall into them. And again of
these four carrying and rotating may be led back to pulling and pushing.
For carrying is in accord with one of the other three modes, since what
is carried is in movement coincidentally, because it is in or on something
20 that is in movement, and what carries it carries it by being pulled,
244a1 pushed, or rotated, so that carrying is common to all three. And rotating
is a compound of pulling and pushing. For what is rotating a thing
is pulling one part of it and pushing another, since it leads one part
away from itself and another part toward itself. So if what is pushing
and what is pulling are together with what is being pushed and what is
5 being pulled, it will be evident that in movement with respect to place
there is nothing intermediate between moved and mover.

But then that this is so is clear even from the definitions. For pushing
is a movement from the pusher itself, or from something else, to
something else, while pulling is movement from something else to the
puller itself, or to something else, when the movement of what is pulling
is faster than the one that would separate the continuous things
10 from each other, since it is this way that one is pulled along with the
other.[683] (But perhaps it might seem that there is also another way of

pulling, since it is not in this way that wood pulls fire.[684] But it makes
no difference whether what pulls is in movement or remains at rest
when it is pulling, since in the latter case it pulls from where it is, in the
former from where it was.) Now it is impossible for a mover to move
anything either from itself to something else or from something else to
the mover itself without making contact with it. So it is evident that in 15
movement with respect to place there is nothing intermediate between 244b1
the mover and the moved.

But then neither is there any between what is altered and what alters
it. This is clear from induction. For in every case we find that the last
thing that alters something is together with the first one that is altered. 5
For our assumption is that what is being altered is altered by being
affected with respect to its so-called affective qualities. For every body 5a
differs from another body in possessing a greater or lesser number 5b
of perceptible characteristics or the same ones to a greater or lesser
degree.[685] But then the alteration of what is altered is also due to the 5c
aforementioned perceptible characteristics. For they are affections of 5d
the relevant underlying quality.[686] For we say that a thing is altered
by becoming hot, sweet, dense, dry, or white, saying this alike of the
inanimate as well as of the animate, and again, in the case of animate
things, alike of the parts that are capable of perception and of the perceptual
capacities themselves. For the perceptual capacities themselves 10
are also altered in a way. For active perception is a movement through
the body, when the perceptual capacity is affected in a certain way.
Whatever way the inanimate can be altered, then, the animate can also
be altered, whereas not every way that the animate can be altered is a
way the inanimate can (for it cannot be altered with respect to the perceptual
capacities). Also, the inanimate is not aware of being affected, 15
whereas the animate is aware. But nothing prevents the animate too
from being unaware when the alteration is not with regard to the perceptual 245a1
capacities. If indeed, then, the alteration of what is altered is
due to perceptible things, in every case of this sort of alteration at any
rate it is evident that the last thing that alters something and the first
thing that is altered are together. For the air is continuous with what
causes the alteration, and the body that is altered is continuous with 5
the air. Again, color is continuous with the light, and the light with the
sight.[687] And it is the same way with hearing and smelling, since the
first mover relative to what is moved is the air.[688] Similarly, in the case
of tasting, since the flavor is together with the capacity of taste.[689] And
it is likewise with things that are inanimate and incapable of perception.
So there can be nothing intermediate between what is altered and 10
what alters it.

Nor, again, can there be anything intermediate between what is increased and what increases it. For the primary thing that causes the increase does so by becoming attached to what is increased in such a way that the whole becomes one. And again what decreases something decreases it when some part becomes detached from what is decreased. It is necessary, then, for what increases something or what decreases something to be continuous with what is increased or decreased, and between continuous things there is nothing intermediate.

It is evident, then, between the moved and the mover that is primary, or last in relation to the moved, there is nothing intermediate.[690]

VII 3[691]

That everything that is altered is altered due to perceptibles, and that there is alteration only of those things that are said to be intrinsically affected by these, is a fact that may be theoretically grasped from the following consideration. For of the others it would be most natural to suppose that that there is alteration in figures and shapes, and in states, that is, in acquiring or losing them.[692] But in neither of these two is there alteration.[693]

For when the thing that is being configured or arranged has been completed, we do not say that it is what it is composed of—for example, we do not say that the statue is bronze, or the candle wax, or the bed wood, but using a paronym, that they are brazen, waxen, or wooden.[694] But when a thing has been affected or altered, we still refer to it by its original name. For we say that the bronze or the wax is hot or hard, and not only in this way, but we also say that the wet or the hot is bronze, referring homonymously to the matter by using [the name of] the affection.[695] So, then, if as regards figure and shape what comes to be and has the shape in it is not said to be what it is composed of, but as regards affections and alterations it is said to be this, it is evident that the comings to be of the former cannot be alterations.

Further, it would seem to be absurd even to speak in this way, namely, of a human being or a house or anything whatsoever that has come to be as having been altered. But though each such coming to be presumably must involve something's being altered, for example, the matter's being condensed or rarified or heated or cooled, nonetheless it is not *the things that are coming to be* that are altered, and their coming to be is not an alteration.

But then states, whether of the body or of the soul, are not alterations either. For some are virtues and others vices, and neither virtue nor vice is an alteration.[696] Instead, virtue is a sort of completion (for when each thing acquires its own virtue, at that point it is said to be complete, since then it is most of all in accord with its nature, just as a circle is complete when it has most of all become a circle and when it is best) and vice the passing away and departure of this completion.[697] Hence, just as we do not speak of the completion of a house as an alteration (for it is absurd if the coping-stone or roof-tile is an alteration, or if in receiving its coping-stone or roof-tile the house is being altered but not completed), it is the same way in the case of virtues and vices and of what possesses or acquires them. For virtues are completions and vices departures, so that they are not alterations.

Further, we say that all virtues are in [the category of] being related in a way to something.[698] For those of the body, such as health and good condition, lie in a blending and proportion of hot and cold things, either of one in relation to another within the body or to what encompasses it.[699] It is likewise in the case of beauty, strength, and all the other virtues and vices. For each is in [the category of] being related in a way to something and puts its possessor in a good or bad condition with regard to its proper affections—the proper ones being those due to which it naturally comes to be or passes away.[700] Since, then, relatives are neither themselves alterations nor is there alteration, coming to be, or in general any change whatsoever of them, it is evident that neither states nor the losing or acquiring of them are alterations.[701] But presumably when these come to be or pass away some other things must be altered—as in the case of both the form and the shape—for example, hot, cold, dry, and wet things, or in whatever it may be that these states first reside.[702] For each virtue or vice is said to be concerned with those things by which its possessor is naturally altered. For a virtue makes its possessor be either unaffectable or capable of being affected in such-and-such a way, whereas vice makes it be capable of being affected or unaffectable in the contrary way.[703]

It is likewise too in the case of states of the soul. For all these also belong in [the category of] being related in a way to something, the virtues being completions, the vices departures. Further, virtue puts its possessor in a good condition with regard to its proper affections, whereas vice puts it in a bad one. So these will not be alterations either, and neither, then, will the losing or acquiring of them be. But when they come to be the perceptual part [of the soul] is necessarily altered. And it is altered by perceptibles. For every virtue of character is concerned with bodily pleasures and pains, and these lie in doing actions, in remembering, or in expectation. Now those that lie in action are in accord with perception, so that it is due to something perceptible that they are moved, whereas those that lie in memory or in expectation are due to this. For people are pleased either by remembering what has affected them or by expecting what is going to affect them. So every such pleasure must come to be due to perceptibles. And since when pleasure and pain come to be, virtue and vice come to be as well (for they are concerned with these), and pleasures and pains are alterations of the perceptual part, it is evident that something must also be altered in losing or acquiring these states.[704] So, though their coming to be involves alteration, they themselves are not alterations.

But then the states of the thought-involving part are not alterations either, nor is there any coming to be of them.[705] For very much more [than in the case of the virtues of character] we speak of what has scientific knowledge as belonging in [the category of] being related in a way to something.[706] Further, it is also evident that there is no coming to be of these. For what has scientific knowledge potentially comes to have scientific knowledge actively not at all by being itself moved but by the presence of something else. For when the particular comes to be present, the universal is in a way scientifically known by means of the particular.[707] Again, there is no coming to be of the use and activity of the state, unless one thinks that there is also a coming to be of seeing and touching, since its using and being in activity are similar to these. And the acquisition of scientific knowledge at the start is not a coming to be or an alteration, since we are said to scientifically know and to understand as a result of our understanding's having come to rest and to a stop, and there is no coming to be of being at rest, or indeed of any change at all, as has also been said earlier.[708]

Further, just as when someone changes from drunkenness, sleep, or disease to the contrary states we do not say that he has *come to have* scientific knowledge again, even though he was incapable of using his knowledge [while drunk, asleep, or diseased], so likewise when he acquires the state at the start we should not say either [that he is *coming to have* scientific knowledge]. For it is due to the soul's stopping its natural restlessness that something becomes wisdom or scientific knowledge. That is also why children are incapable of either learning or discerning by means of the perceptible capacities as well as their elders are, since the disturbance and movement [in their souls] is great, and it settles down and comes to rest with regard to some things due to nature itself, and with regard to others due to other causes, but in both cases accompanied by the alteration of certain things in the body, just as in the case of the use and activity [of the understanding part] when someone becomes sober or wakes up.[709]

It is evident, then, from what has been said, that being altered and alteration occur in perceptible qualities and in the perceptible part of the soul, and in nothing else except coincidentally.

VII 4

One might raise a puzzle as to whether every movement is commensurable 10
with every other or not.[710] If, accordingly, they are all commensurable,
and sameness of speed is equal movement in equal time, then
a circumference may be equal to a straight line, or, of course, greater
or less than it. Further, an alteration may be equal to a spatial movement,
when in an equal time one thing has altered while another has
spatially moved. An affection, therefore, may be equal to a length. But
this is impossible. Or is it rather, therefore, that when in an equal time 15
they move equally, at that time there is equal speed, but an affection is
not equal to a length, so that an alteration is not equal to or less than
a spatial movement, so that not all movements are commensurable?[711]

In the case of the circle and the straight line, though, how will that
work? For it is absurd if the movement of one thing in a circle is not
similar to that of another in a straight line, but instead is immediately
faster or slower, just as if one is downhill and the other uphill. Nor does 20
it make any difference to the argument if one says that the movement
must be immediately faster or slower. For then the circumference will
be greater or less than the straight line, so that they can be equal too. 25
For if in time t the faster O_1 traverses the circle B, while the slower
O_2 traverses the straight line C, then B is greater than C. This is what **248^b1**
"faster" was said to mean.[712] Then too if in less time a thing traverses an
equal distance, it is faster. So there will be a part of t in which O_1 traverses
a part of the circle equal to C, while O_2 traverses C in the whole
time t. But then if these are commensurable, what has just been said
follows, namely, a straight line will be equal to a circle. But these are 5
not commensurable, nor, therefore, are the movements.[713]

But [it might be responded] it is the things that are not synonymous
that are all incommensurable.[714] For example, why is it that a pencil, a
wine, and the highest note in a scale are incommensurable with respect
to sharpness? Because homonymous things are not commensurable.[715]
The highest note is commensurable with the next note, since "sharp"
as applied to both signifies the same thing. Is it, therefore, that "fast" as 10
applied to both O_1 and O_2 does not signify the same thing, and does so
far less in the case of an alteration and a spatial movement?

Or, in the first place, is this not true: that if things are not homonymous,
they are commensurable? For "much" signifies the same in the

case of water as in that of air, and these are not commensurable [in this respect].[716] Or if not this, "double" at any rate signifies the same (since it signifies the ratio of two to one), and these are not commensurable in this respect either. Or even in the case of these does the same argument apply? For even "much" is homonymous. Yet of some terms even the accounts are homonymous—for example, if someone were to say that "much" means "such-and-such an amount plus more" and that "such and such an amount" signifies distinct things in distinct cases. Also, "equal" is homonymous, and, if that was so, "one" would also be immediately homonymous. And if this was so, "two" would be homonymous as well, since why would some of these be commensurable and others not, if indeed there was a single nature involved in any of them?

Or is it because the primary recipient is distinct?[717] A horse, then, and a dog are commensurable as to which is whiter (for what the whiteness is primarily in is the same: the surface), and similarly with respect to magnitude. But water and noise are not commensurable [in respect to whiteness], since what it is [primarily] in is distinct.[718] Or is it clear that in *this* way all the cases will be made into one, namely, by saying that each exists in a distinct primary recipient, that is, the equal will be the same in each case, as will the sweet and the white, but in a distinct case it will be in a distinct recipient? Further, it is not any random thing that is receptive of a random attribute, instead one is primarily receptive of one.

But must it therefore be the case that commensurable things are not only not homonymous but that no differentiae belong either to themselves or to what they are in? I mean, for example, in the way that color has differentiae. For this is surely why things are not comparable with respect to it (for example, as to which of the two is more colored, not with respect to a particular color, but insofar as it is a color), but are comparable with respect to whiteness.[719]

Similarly too where movement is concerned, things have the same speed which in an equal time move such-and-such an equal amount.[720] If, then, in this [time] one [half] of a thing's length is altered while the other half is spatially moved, is the alteration equal to—that is, does it have the same speed as—the spatial movement?[721] But that would be absurd. And the cause of this is that movement has species. So [must we correct our statement and say that] if things in equal time *spatially move* an equal length, they are of equal speed? But then a straight line and a circumference will be equal.[722] What, then, will the cause of this be? Is it that spatial movement is a genus or that line is a genus? For the time is the same in species. Or are the two [the movement and the line] together divided in species?[723] For spatial movement has different species if that over which the movement occurs has different species.[724] (And sometimes it has different ones if that by which it occurs has different ones—if by feet, it is walking, if by wings, flying. Or is that not so, but is it rather by its shapes that spatial movement is distinguished?[725]) So [must we correct our statement again and say that] things are of equal speed if in an equal time they traverse the same magnitude—where being the same consists in being undifferentiated in species and [thus] in the movement over it being undifferentiated?

So we must investigate this: what the differentiae of movement are. And the foregoing argument indicates that the genus is not something that is one, but that beyond this case there are many others that are overlooked, and that among cases of homonymy some are far removed from each other, some have some similarity to each other, and some are close either in genus or by analogy, which is why they do not seem to be cases of homonymy though they really are. When, then, is there a distinct species? Is it when the same thing is in distinct subjects, or when distinct ones are in distinct ones? And what will the defining mark be? Or by what are we to discern that the white and the sweet are the same or distinct? Is it because they appear distinct in distinct subjects, or is it because there is no sameness at all?

Concerning alteration, then, how will one alteration have a speed equal to that of another? If to become healthy is to be altered, one person may be cured quickly, another slowly, and some at the same time, so that some alterations will be of equal speed, since in the latter case each was altered in an equal time. But what altered? For we cannot speak of equal here, but rather what in [the category of] quantity is equality, is here similarity.[726] However, let things be of equal speed if in an equal time their *change* is the same. Is it, then, what the affection is in or the affection itself that must be commensurable? Here in our example, indeed, it is because health is the same that we may ascertain that one alteration is neither more nor less than the other but that both are similar. But if the affections are distinct, as when a thing alters by becoming pale and by becoming healthy, in these cases there is no sameness, equality, or similarity, insofar as these affections at once make the alterations differ in species, and so there is not just one species, any more than there is in the case of spatial movements.[727] So we must ascertain how many species there are of alterations and how many of spatial movements.

If, then, the things that are in movement—that is, the ones to which the movements belong intrinsically and not coincidentally—differ in species, then their movements will also differ in species. On the other hand, if the things differ in genus, their movements will differ in genus,

and if in number, in number. But then, should we look to the affection,
15 as to whether it is the same or similar, to find out if the alterations are
of equal speed, or to the things that are being altered, as to whether, for
example, so-and-so much of one has become pale and so-and-so much
of the other? Or should we look to both, and regard the alterations as
the same or not the same according as the affections are the same or
not the same, and equal or unequal according as the things altered are
equal or unequal?

And in the case of coming to be and passing away the investigation
is the same: how is one coming to be equal in speed to another?
20 They are of equal speed if in equal time two things come to be that
are the same, that is, indivisible [in species]—for example, two human
beings but not two animals. And one is faster than the other if in an
equal time the things that come to be are distinct (for here we do not
have two things between which distinctness is like dissimilarity), or, if
substance is number, then within the same species one number may
be greater than another.[728] But what is common to these is nameless,
25 and each is like "more" (as applied to a higher or superior degree of an
affection) on the one hand and like "greater" (as applied to a quantity)
on the other.

VII 5

A mover always moves something, in something, and as far as something
(I mean by "in something" time, and by "as far as something"
that the distance traversed is a certain quantity). For always when a
thing is causing movement it at the same time has caused movement,
so that there will be a certain quantity that has been traversed and a
30 certain quantity in which it has been traversed. Accordingly, if A is the
mover, B the moved, D the distance traversed, and t the time in which
250^{a}1 it is traversed, then in the same time t a capacity equal to that of A will
move half of B twice D, and in half of t it will move half of B the whole
of D. For in this way there will be proportionality. And if a capacity
equal to A moves what is equal to B as much as D in a time equal to t,
5 and half of D in half of t, then half its strength will move half of B the
half of D in a time equal to t. For example, let E equal half the capacity
of A and F equal half of B. Then the strength is similarly and proportionally
related to the weight in each case, so A will move B and E will
move F an equal distance in an equal time.

Also, if E moves F distance D in time t, it does not necessarily follow
10 that in the same time E can move twice F half of D. If, then, A moves
B distance D in time t, it is not necessary that in the time t, or in some

part of it, the half of A, which is E, will move B a part of D whose ratio to the whole of D is proportional to that between A and E. For it may happen that E will not move B at all. For if the whole strength moved it so-and-so much, it does not follow that half that strength will move it any quantity in any time whatsoever. For otherwise one man might move a ship, if indeed the strength of the ship-haulers and the distance they all move it are divisible into their number.

This is why Zeno's argument is not true when he says that any part whatsoever of the millet makes a sound. For there is nothing to prevent any part from failing in any interval of time whatsoever to move the air that the whole bushel moves when it falls. In fact it does not even move such a part of the whole as it would move if it were by itself. For in the whole none exists except potentially.

On the other hand if there are two movers and each of the two moves one of two things so-and-so much in such-and-such time, then the capacities in composition will also move the weights in composition an equal distance in an equal time. For there is proportionality.

Is it also this way, then, in the case of alteration and in the case of increase? [Surely, it is.] For there is something that causes the increase, something that is increased, in so much time, and a quantity that the one causes the other to increase by and that the other increases by. Similarly, there is what alters something and what is altered, a certain quantity of alteration with respect to the more and the less, and in a quantity of time.[729] And in twice as much time there is twice as much alteration, and twice as much in twice as much. And half in half the time, or in half the time half, or in equal time twice it.

On the other hand, if what alters something or causes it to increase does so-and-so much of it in such-and-such time, it does not necessarily follow that the half will be done in half the time, or that in half the time the half will be done.[730] Instead, it may happen that it does not alter anything or increase anything at all, as in the case of weight.

BOOK VIII

VIII 1

Did movement come to be at some time, without having existed before, and does it pass away again in such a way that nothing is in movement? Or is it that it neither came to be nor passes away, but always existed and always will exist and, being deathless and unceasing, is present in beings like a sort of life for things composed by nature?

Now that there is such a thing as movement is asserted by all those who say anything about nature, because they describe the production of the cosmos, and all their theoretical knowledge is concerned with coming to be and passing away, which could not exist if movement did not exist.[731] But those who say that there are unlimited cosmoses, some coming to be and some passing away, are saying that there is always movement (for these comings to be and passings away necessarily involve movement), whereas those who say that there is one cosmos, or one that does not always exist, also make assumptions about movement that are in accord with their account.[732]

If, then, it is possible that at some time nothing is in movement, this must come about in one of two ways. For either it will be as Anaxagoras says (for he says that all things were together and at rest for an unlimited time, and then the [divine] understanding produced movement in them and disaggregated them) or as Empedocles does, with things being in turn in movement and again at rest—in movement when love makes one from many or strife makes many from one, and at rest in the intermediate times, as he says:

> Thus insofar as they tend to grow into one from more than one,
> And in turn, with the one growing apart, to become more than one,
> They come to be and do not have a steadfast life:
> But insofar as they never cease continually alternating,
> Their cycle is always immovable.[733]

For by "but insofar as they never cease continually alternating" we must take him to mean "from this to that."[734] We must investigate, then, how things stand where these issues are concerned. For to see the truth will be useful not only to the theoretical knowledge concerned with nature, but also to the methodical inquiry concerned with the primary starting-point.[735]

Let us start first from what we previously determined in the *Physics*.[736] We say, then, that movement is the activation of the movable insofar as it is moveable.[737] For each sort of movement, therefore, there must exist things that are capable of it. In fact, even apart from the definition of movement, everyone would agree that for each sort of movement it must be what is capable of the movement that is in the movement—for example, it is what is alterable that is altered and what is changeable with respect to place that is in spatial movement. So there must be a burnable before there is a being burnt, and a capable of burning something before there is a burning. Accordingly, these things too, having not existed, must come to be at some time, or they must always exist.

Accordingly, if each of the movable things came to be, then before the movement in question there must have been another change and movement in which the thing capable of being moved or of moving something came to be. But if such things always preexisted without there being any movement, it is evidently absurd when we first stop to think about it, and must become still more so as we go on doing so. For if some things are movable while others are capable of moving things, if there is a time when there is a first mover and a first moved, and another time when there is no such thing, but it is at rest, it must change previously. For there was some cause of its being at rest, since rest is the lack of movement. So prior to the first change there will be a previous change.

For some things move things in only one way, while others do so with contrary movements—for example, fire heats but does not cool, whereas the science of contraries seems to be one science.[738] Now, there appears to be something similar occurring even in the former case (for cold heats in a way by turning aside or retiring, just as the person with scientific knowledge errs voluntarily, when he uses his scientific knowledge in the reverse way), but things at any rate that are capable of affecting or being affected, or of moving something or being moved, are not capable of it under all conditions, but only if they are in a certain condition and are near each other.[739] So when one thing has approached another, it moves it, and the other is moved, that is, when one was such that it was capable of moving the other and the other of being moved. If, accordingly, the movement was not always going on, it is clear that they were not in a condition such that the one was capable of being moved and the other capable of moving it, but rather one of them had to change. For in things that are related it is necessary for this to happen—for example, if one thing was not double another but is double it now, one of the two, if not both, must have changed. Therefore, there will be a change previous to the first change.

10 (In addition to these considerations, how will there be a before
and after if time does not exist?[740] Or how will there be time if move-
ment does not exist? If time is really a number of movement or a sort
of movement, if indeed there is always time, movement too must be
eternal.[741] But then where time is concerned at least, all, with a single
exception, are evidently of one mind, since they say that it is inca-
15 pable of coming to be. In fact it is because of this that Democritus in
particular shows how it is impossible for everything to have come to
be, since time is incapable of coming to be. Plato alone, by contrast,
has it come to be, since he says it exists together with the heaven,
and that the heaven came to be.[742] If, then, it is impossible for time
to exist or to be understood without the now, and if the now is a sort
20 of intermediate, since it has a starting-point and an end-point at the
same time, a starting-point of the future time and an end-point of the
past time, it follows that time must always exist.[743] For the extremity
of the time taken as last will lie in a certain one of the nows, since
there is nothing to take in the time besides the now, so that since the
25 now is a starting-point and an end-point, there must always be time
on both sides of it.[744] Moreover, if time does exist, it is evident that
movement must exist as well, if indeed time is a sort of attribute of
movement.)[745]

The same argument also applies to movement's not being capable
of passing away. For just as the coming to be of movement implied
30 the existence of a change previous to the first, in the same way here
it implies the existence of one later than the last. For a thing does not
cease being in movement and being movable at the same time (for
example, being burned and being burnable, since it is possible for
something to be burnable that is not burning), and neither do being
capable of moving something and moving it. And what is capable
of causing something to pass away will have to pass away after it
252a1 has caused it to pass away, and what is capable of causing *this* to
pass away will in turn have to pass away later. For passing away too
is a sort of change. If, then, these things are impossible, it is clear
that there is eternal movement, not movement at one time, rest at
another. In fact to say such things seems more a matter of fabricat-
ing stories.

5 And the same is true for saying that things are naturally this way
and that one must acknowledge it as a starting-point, which is pre-
cisely what Empedocles would seem to be saying, namely, that for love
and strife alternately to rule and cause movement holds of things by
necessity, and to be at rest in the intermediate time. And maybe those

who posit a single starting-point of movement, such as Anaxagoras, would also speak in this way.[746] But surely there is nothing *disorderly* in things that happen by nature or in accord with nature. For nature is a cause of order in everything. Between one unlimited thing and another unlimited thing, however, there is no ratio, whereas all order is ratio. But for things to be at rest for an unlimited time, then in movement at some time, and no difference at all to cause this happening now rather than earlier, and with no order of any sort involved either, is no longer a work of nature. For what holds by nature is either simple, and not sometimes one way and sometimes another (for example, fire spatially moves upward by nature, and not sometimes up and sometimes not), or it involves some ratio, if it is not simple.

That is why it is better to say with Empedocles, or anyone else who may have spoken as he does, that the universe is alternately at rest and in movement again. For such a state of affairs already involves some sort of order. But even someone who says this should not only state it but also say what the cause of it is—and he should neither merely posit something or assume an un-argued axiom, but should produce either an induction or a demonstration.[747] For the things assumed by Empedocles are not themselves causes of this alternation, nor was it the being for love or for strife to cause it, but for the one to aggregate and for the other to disaggregate.[748] And if he is going to go on to determine the details of their alternation, he must say under what conditions it happens, just as he says that there is something that causes *human beings* to aggregate, namely, love, and that enemies flee each other. For he assumes that this also holds in the whole cosmos, because it is apparently so in some cases. And that love and strife rule for equal periods of time also requires some argument.

In general, to think that this is an adequate starting-point, namely, the fact that something always is or comes to be in this way, is an incorrect assumption to make. Thus Democritus refers back causes concerned with nature to the fact that this is how things also happened previously. Of what always happens, however, he does not think it fitting to seek a starting-point, which in some cases is a correct thing to say, but that it holds in all cases is not correct. For a triangle has its **252^b^1** angles always equal to two right angles as well, but nonetheless there is some other cause of the eternality of this, although of starting-points that are eternal there is no other cause.[749]

As regards the view, then, that there never was a time when movement did not exist nor will be one when it will not, let this much be said.

VIII 2

The [puzzles] that go contrary to these claims are not difficult to resolve.[750] For it is when people investigate on the basis of considerations like the following that it might most of all seem to be possible for movement to exist though at one time it had not existed at all:

[1] First, no change is eternal. For every change is naturally from something to something, so that every change has as its limits the contraries between which it takes place, and no movement goes on without limit.

[2] Further, we see that it is possible for something to be moved that is neither in movement nor has any movement whatsoever within itself—for example, in the case of inanimate things that are not in movement, either in any part whatsoever or as a whole, but are at rest, but are moved at some time. But they should be either always in movement or always at rest, if indeed movement, having not existed, does not come to be.

[3] This is by far most evident in the case of animate things [than of inanimate ones]. For sometimes, though there is no movement whatsoever in us and we keep still, nonetheless at some moment we are in movement, and a starting-point of movement comes to exist in us from ourselves, even if nothing external moves us. We do not see anything like this in the case of inanimate things, which are always moved by some other external thing. But the animal, we say, moves itself. So if indeed an animal is sometimes entirely at rest, movement might come to exist in an unmoving thing from itself and not from outside. But if this can happen in an animal, what prevents the same thing from happening throughout the universe? For if it happens in the microcosm, it can also happen in the macrocosm. And if in the cosmos, then also in the unlimited, if indeed it is possible for the unlimited to be in movement or at rest as a whole.

[Reply to 1] Of these considerations, then, the first mentioned—that movement to opposites is not always the same and one in number—is correct. For it is perhaps necessary, if indeed it is possible for the movement of what is one and the same to be not always one and the same. I mean, for example, there is a question as to whether the note from a single string is also one and the same, or a distinct one each time, although the string is in the same condition and moves in the same way. But whatever the case may be, nothing prevents some movement from being the same by being continuous and eternal. This will become clearer from what we say later.[751] **253^{a}1**

[Reply to 2] As for what was not in movement being moved, it involves nothing absurd if an external mover of it is sometimes present, sometimes not. We must, however, inquire into how this can happen, I mean, that the same thing is at one time moved by the same potential mover of it and sometimes not. For the one who says [2] does nothing other than raise the puzzle as to why it is that some things are not always at rest and others always in movement.

[Reply to 3] The third consideration might seem to involve the greatest puzzle, namely, as to how movement can take place in things it was not present in before, which is what happens in the case of animate things. For one previously at rest walks later, although nothing external moved it, as it seems. But this is false. For we always see that some innate part in the animal is in movement. And of the movement of it the animal itself is not the cause, but perhaps what encompasses it is. It itself, we say, moves itself not in the case of every sort of movement, but in the one with respect to place. Nothing prevents, then, many movements from taking place in the body due to what encompasses it (or rather it is presumably necessary for this to be so), and of these some move thought or desire, and that in turn moves the whole animal. This happens, for example, in cases of sleep.[752] For although no internal perceptual movement takes place at all, yet some sort of internal movement does, and the animal wakes up again. But in fact about these issues too things will be evident from what follows.[753]

VIII 3

The starting-point of our investigation will also be the very one having to do with the puzzle that has just been mentioned: why some beings are sometimes in movement and in turn sometimes at rest.[754] Now, necessarily either [1] all things are always at rest, or [2] all things are always in movement, or [3] some things are in movement and some at rest, and in this last case again either [3a] the things in movement are always in movement and the things at rest always at rest, or [3b] all things are alike naturally in movement or at rest, or [3c] the remaining and third alternative. For it is possible for some beings to be always unmoved, others always in movement, while some have a share in both conditions. And this is just the one that we must assert. For it holds the resolution of all the puzzles we raised, and is the end for us of this present work.

[Response to 1] Now to say that all things are at rest and to seek an account of it, disregarding perception, is a sort of lack of eagerness in thinking, a disputing of the whole rather than some part of it, and is directed not only against the natural scientist, but against (one might almost say) all the sciences and all beliefs, because all of these make use

253^b1 of movement. Further, just as in accounts concerned with mathematics objections to starting-points are not directed against the mathematician, and likewise in all the other cases, so the position stated just now is not directed against the natural scientist, since it is a hypothesis for him that nature is a starting-point of movement.[755]

[Response to 2] To say that all things are in movement is also pretty much false, though less contrary to our methodical inquiry than [1].[756] For in the *Physics* nature was posited as a starting-point of rest as well as of movement, and likewise movement as something caused by nature.[757] In fact some thinkers maintain not that some of the beings are in movement and some not, but that all of them always are, though our perception fails to notice this. Although they do not define what sort of movement they mean, or whether they mean all sorts, it is not difficult to reply to them. For increase and decrease cannot go on continuously, but there is also what is intermediate.[758] The argument is like the one that deals with dripping water wearing away stones and plants splitting them by growing up through them. For if so-and-so much was driven out or taken away by the dripping water, it does not follow that half that much was previously driven out or taken away in half the time. But just as in the case of hauling a ship, so-and-so many drops move so-and-so much, but a part of them does not move that much in any period of time.[759] What is taken away, it is true, is divisible into many parts, but none of those was moved separately, but all were moved together. It is evident, then, that from the fact that decrease is divisible without limit it does not necessarily follow that some part is always being taken away, but rather that the whole is at some time taken away.

It is likewise in the case of any sort of alteration whatsoever. For if what is altered is divisible without limit into parts, it does not follow because of this that the alteration itself is as well, on the contrary it often happens all at once, as in the case of freezing. Further, whenever someone has fallen ill, there must be a time during which he will become healthy [if he does]—he cannot change in an instant. And the change must be to health and nothing else. So to say that alteration is continuous is to dispute what is far too evident to dispute. For alteration is to what is contrary, whereas the stone becomes neither harder nor softer. And as regards spatial movement, it would be a wonder if it escaped our notice whether it was in spatial movement downward or resting on the earth. Further, earth and each of the other elements necessarily remain in their proper places and are removed from them only by force.[760] Hence, if indeed some of them are in their proper places, it is
254^a1 necessary that not all things can be in movement with respect to place.

From these and other such arguments one may be convinced, then, that it is impossible either [2] for all things to be always in movement or [1] for all to be always at rest.

[Response to 3a] But then it is not possible either for some things to be always at rest and some things to be always in movement, but for nothing to be at rest at one time and in movement at another time. And we must say that it is impossible in these cases too on just the grounds that it was in the previous cases we described, since we see the sorts of changes we mentioned occurring in the same things, and, in addition, that the person who disputes this is in conflict with the evident facts.[761] For there can be no such thing as increase, nor will movement by force occur, if nothing that is previously at rest will be moved contrary to nature. This account, then, does away with coming to be and passing away.[762] But movement seems to pretty much everyone to be *a sort of* coming to be and passing away.[763] For if something changes to this, it comes to be this, or in this, and if it changes from this, it ceases to be this, or in this.[764] So it is clear that there are things that are sometimes in movement and sometimes at rest.

[Response to 3b] The claim that all things are sometimes at rest and sometimes in movement must at this point be brought together with the arguments just given. And, drawing on the present distinctions, we must again posit a starting-point, namely, the very same one from which we started previously. For surely either [1] all things are at rest or [2] all are in movement, or [3] some are at rest and some in movement. And if some are at rest and others are in movement, then, of necessity, either [3b] all of them are sometimes at rest and sometimes in movement, or [3a] some are always at rest, others always in movement, or [3c] some are always at rest, some always in movement, while some are sometimes at rest and sometimes in movement. Now we have said earlier that it is not possible for all things to be at rest, but we should state it again now.[765] For even if things are truly in this state, as certain people assert, and being is unlimited and immovable, at least it does not at all appear to be that way according to perception, but instead many beings appear to be in movement.[766] If indeed, then, there is false belief, or belief at all, or even if there is imagination, or if things seem to be sometimes one way and sometimes another way, there is also movement. For imagination and belief seem to be sorts of movements.[767] But to investigate this question at all, and to seek an argument when we are too well off to need an argument, is to be a bad discerner of what is better and what is worse, and what is trustworthy and what is not trustworthy, and what is a starting-point and what is not a starting-point.[768]

It is likewise impossible for all things to be in movement or for some things to be always in movement and the others always at rest.[769] For against all these views one trustworthy thing is enough: we in fact *see* some things that are sometimes in movement and sometimes at rest. So it is evident that for all things to be at rest or in movement continuously is just as impossible as for some to be always in movement while others are always at rest.

It remains, then, to get a theoretical grasp on whether [3b] all things are capable of being in movement and of being at rest, or whether [3c] some are like this while some are always at rest and some always in movement. For it is this latter that we must show.

VIII 4

Now of things that cause movement or are moved, some cause movement or are moved coincidentally, some intrinsically—coincidentally, for example, by belonging to the movers or moved, or with respect to their parts, and intrinsically, not by belonging to the mover or the moved, or by a part of them causing movement or being moved.[770]

Of the intrinsic movements, some are due to the thing itself, some due to something else, and some are by nature, others by force and contrary to nature. For what is moved by itself is moved by nature, as in the case of each animal.[771] (For an animal is moved by itself, and things that have the starting-point of movement within themselves we say are moved by nature—which is why the animal as a whole moves itself by nature, yet its body may be moved both by nature and contrary to nature, since it makes a difference what sort of movement it happens to be moved in and from what element it is composed.) And of things that are moved by something else, some are moved by nature and some contrary to nature—contrary to nature, for example, earthy things moving upward and fire downward. Further, the parts of animals are often moved contrary to nature, that is, contrary to their [normal] positions and modes of movement.[772] Also, that what is in movement is moved by something else is most of all evident in the case of things that are in movement contrary to nature, because they are clearly moved by something else. And after the contrary-to-nature cases, the next most evident of those that are in accord with nature, are the ones that move due to themselves—for example, animals. For what is unclear in this case is not whether they are moved by something, but rather how we should distinguish in them between the mover and the moved. For just as in ships and things not composed by nature, so too in animals the mover and the moved seem to be distinct, and in this way the entire animal moves itself.

What is most puzzling, though, is the remaining case of those we last distinguished.[773] For of things moved by something else we posited that some are moved contrary to nature, whereas some are left opposed to these because they are moved by nature. It is these cases that produce the puzzle as to what their movement is due to—for example, in the case of light and heavy things. For these are moved to the opposite places by force, but to their proper places—the light up, the heavy down—by nature. But what they are moved by is no longer evident, as it is when they are moved contrary to nature. For it is impossible to say that they are moved by themselves. For this is characteristic of life and is special to animate things. Also, they would have been capable of stopping themselves (I mean, for example, if a thing is cause of its own walking, it is also cause of its own not walking), so that if it is up to fire itself to spatially move upward, it is clear that it is up to it to spatially move downward as well.[774] It is also unreasonable for things to move themselves with only one sort of movement, if at any rate they do move themselves.[775]

Further, how is it possible for something that is continuous and naturally unified to move itself? For insofar as a thing is one and continuous not by contact, it is unaffectable; but it is insofar as it is separated into parts that one part naturally affects and the other is naturally affected. Therefore, none of the things under discussion move themselves (for they are naturally unified), nor does anything else that is continuous, but rather the mover must be divided in each case from the moved, as we see in the case of inanimate things when an animate one moves them.

It turns out, however, that these things too are always moved by something, as would become apparent if we divided the causes. And it is in fact possible to apply the aforementioned division to movers. For some of them are capable of moving things contrary to nature (a lever, for example, is not capable by nature of moving what is heavy), whereas other things are capable of doing so by nature (for example, the actively hot is able to move the potentially hot, and similarly in other such cases).[776]

In the same way too what is movable by nature is what is potentially of a certain quality or quantity or in a certain place, when it has the corresponding starting-point within itself and not coincidentally (for the same thing may have a quality and a quantity, but the one might belong to the other coincidentally and not intrinsically).[777] When fire and earth, then, are by force moved by something, they move contrary to nature, but they do so by nature when they are engaged in the activities that, in potentiality, are their own.

But since something is said to be potentially something in many ways, this is the cause of its not being evident what such things are moved by—for example, fire up and earth down. For the learner is potentially a scientific knower in another way than the one who already has the scientific knowledge but is not activating it. For always when what is capable of affecting and what is capable of being affected come together, sometimes the potential becomes active—for example, the learner from being potentially one thing becomes potentially another thing (for the one who has scientific knowledge but is not contemplating is in a way potentially a scientific knower, but not in the way he was before he learned).[778] And whenever he is in this latter state, if nothing prevents him, he activates his scientific knowledge and contemplates, or he will be in the contradictory state, that is, in one of ignorance.

The situation is similar in the case of natural things. For the cold is potentially hot, and whenever it changes, by this time it is fire, and it burns, unless something prevents or impedes it. And it is likewise with the heavy and the light. For the light comes to be from the heavy (for example, air from water—for it was first potentially this), and by the time it is light, it will at once be active, if nothing prevents it.[779] The activity of the light is to be somewhere (namely, up) and it is prevented whenever it is in the contrary place.[780] And the situation is similar both in the case of quantity and in that of quality.

And yet this is what is being inquired into, namely, why it is that the light and the heavy do move to their own place. And the cause is that it is natural for them to be somewhere, and this is the being for the light and the heavy, the one being determined by up and the other by down.[781] Things, though, are potentially light and heavy in many ways, as has just been said. For when something is water it is in a way at least potentially light, and when it is air it is still potentially light, for something may impede it from being up. But if the impediment is removed, it becomes active and moves always upward. In a similar way a quality too changes to being active. For scientific knowing changes at once to contemplating, if nothing prevents it. And a quantity is at once expanded, if nothing prevents it.[782] And the one who removes what supports or prevents in a way causes movement and in a way does not—for example, the one who pulls away a supporting pillar or removes a stone from a wineskin in the water.[783] For he moves the thing coincidentally, just as the ball that bounced back was moved not by the wall but by the thrower. It is clear, therefore, that none of these things moves itself. However, each does have a starting-point of movement, not of causing movement or of affecting, but of being affected.

If, then, all things that are in movement are moved either by nature or contrary to nature and by force, and if things moved by force and contrary to nature are all moved by something, and something other than themselves, and if, in turn, things moved by nature are moved by something, both those moved by themselves and those not moved by themselves (for example, the light and the heavy—for they are moved either by what caused them to come to be and made them light or heavy, or by what removed the thing that was impeding or preventing), **256a1** then all things that are in movement are moved by something.[784]

VIII 5

And this will happen in one of two ways. Either [1] it is not through itself that the mover moves the thing, but rather it is through something else the mover moves it, or [2] it is through itself, and this latter mover will act either [2a] first after the last movement or [2b] through several intermediates—for example, the stick moves the stone, which is moved by the hand, which is moved by the human being, who is no longer moved by anything else.[785]

We say of course that both things cause movement, both the last and the first mover, but more so the first. For it moves the last, but the last does not move the first, and without the first the last will not move anything, whereas the first will do so without the last—for example, the stick will not move anything if it is not moved by the human.

If, then, everything that is in movement must be moved by something, and either [1] by something moved by something else or [2] not, and if it is moved by something else, there must be some first mover that is not moved by anything else, whereas if the first mover is of the latter sort, there is no necessity for the other sort (since it is impossible for a series of movers that are moved by something else to go on without limit, since of unlimited series there is no first member)—if, then, everything that is in movement is moved by something, and the first mover is moved, but not by anything else, it must be moved by itself.

Further, it is also possible to go through the same argument in the following way. For every mover moves something by means of something. For the mover moves either [1] by means of itself or [2] by means of something else—for example, a human being moves something either by means of himself or by means of a stick, and the wind knocked something down either by means of itself or by means of a stone driven by it. But it is impossible for a mover to move something without moving by means of itself that by means of which it moves the thing. But if it moves it by means of itself, there is no necessity for there to be anything else by means of which it does the moving, whereas if there is something else by means of which it does the moving, there must be something that causes movement not by means of something [else] but by means of itself, or the series will go on without limit. If, then, a moved thing moves something, it is necessary for the series to stop and not go on without limit. For if the stick causes movement by being moved by the hand, the hand moves the stick, whereas if something else causes movement by means of the hand, then something else is the mover of the hand as well. Whenever, then, [2] movement by means of something is at each stage caused by something else, there must be [1] some prior thing that causes movement by means of itself. Hence, if this thing is moved, but nothing else is the mover of it, it must move itself. So according to this argument too, either what is moved is immediately moved by something that moves itself or at some time the series arrives at such a thing.

And if, in addition to the things we have just said, we investigate in this third way, these same conclusions will result. For if everything that is in movement is moved by something that is in movement, either [1] this being in movement belongs to the movers coincidentally, so that each of them causes movement, but not because it is itself in movement, or [2] it does not belong coincidentally but intrinsically. In [1] the first case, if the mover is moved coincidentally, it is not necessary for it to be moved. But if this is so, clearly it is possible that at some time no being is in movement. For what is coincidental is not necessary, but admits of not being.[786] Hence, if we posit what is possible, nothing impossible will result, but presumably a falsehood may. But for there to be no movement is impossible. For it was shown previously that there must always be movement.[787]

Also, this result is reasonable. For there must be three things: the mover, the moved, and that by means of which the mover moves. Now the moved must be in movement, but it is not necessary for it to move anything, whereas that by which the mover moves must both move something and be in movement, since it changes together with, at the same time as, and in the same respect as, the moved. This is clear in the case of things that cause movement with respect to place, since the movers and the moveds must be making contact with each other up to a certain point.[788] But what moves in such a way as not to be that by which it moves is immovable.[789] And since we see the last thing, namely, what is capable of being moved but does not have a starting-point of movement, and also see what is moved by another and not by itself, it is reasonable, not to say necessary, to suppose that there is also a third thing that causes movement while being immovable.[790] That is why Anaxagoras speaks correctly when he says that the [divine] understanding is unaffectable and unmixed, since he makes it the starting-point of movement.[791] For only in this way could it cause movement while being itself immovable, and have supreme control only by being unmixed.

[2] But then if the mover is moved not coincidentally but necessarily, and if it were not moved, it would not move anything, it is necessary for the mover, insofar as it is moved, to be moved so that it is in accord with the same species of movement as the moved, or in accord with a distinct one.[792] I mean, for example, either that [2a] what is heating something is itself being heated, what is making something healthy is becoming healthy, and what is carrying something is being carried, or that [2b] what is making something healthy is being carried and what is carrying something is being increased in size. But it is evident that the latter is impossible. For one should speak [of the movements by] dividing as far as the atomic [species]—for example, one should say that if someone is teaching some topic in geometry, he is being taught this same topic, and that if he is throwing something, he is being thrown in the same manner of throwing. Or it may not be this way, but one genus may derive from another—for example, what is causing spatial movement is increasing in size, and what is causing this increase is being altered by something else, and what is causing this alteration is being moved with another sort of movement. But this series must stop, since the sorts of movements are limited. And to say that the series bends back again, and that what is causing the alteration is spatially moving is to do the same as if one said immediately that what is causing spatial movement is spatially moving, and the one who is teaching is being taught (for it is clear that everything that is moved is also moved by the mover that is higher up in the series, and more so by the prior of two movers). But this is of course impossible. For it follows that the one who is teaching is the one who is learning—although the one must have, and the other not have, scientific knowledge.

Further, what is still more unreasonable is that it follows that everything that is capable of moving something is capable of being moved, if indeed everything that is moved is moved by something that is moved, since it will then be capable of being moved. It is just as if someone said that everything that is capable of making something healthy is capable of being made healthy, and that everything capable of building is capable of being built, either immediately or through several intermediaries. I mean, for example, if everything that is capable of moving something is capable of being moved by something else, but not with the same sort of movement with which it moves its neighbor, but with another sort (for example, what is capable of making something healthy is capable of learning), but by going up through the series we at some time arrive at the same species of change, as we said earlier.[793] Well, the first alternative is impossible, and the second is fabricated. For it is absurd that what is capable of altering something must be capable of being increased. It is not necessary, therefore, for what is moved always to be moved by something else that is itself moved. Therefore, the series will stop. So either what is first moved will be moved by something at rest, or it will move itself.

But then if there were in fact any need to investigate whether what moves itself or what is moved by something else is cause and starting-point of movement, everyone would take it to be the former. For what is itself intrinsically a cause is always prior as a cause to what is itself a cause in virtue of something else.[794] So we must investigate this by making a fresh start: if something moves itself, how and in what manner does it cause movement?

It is necessary, of course, for everything that is in movement to be divisible into parts that are always divisible. For it was shown previously in our universal discussions about nature that everything that is intrinsically moved is continuous.[795] It is impossible, then, for what moves itself to move itself in its entirety. For it would be spatially moved as a whole, and it would spatially move itself with the same spatial movement, while being one and indivisible in species, and it would be altered and alter itself, so that it would be teaching and learning at the same time, and making healthy and being made healthy with the same health. Further, it was determined that it is the movable that is moved.[796] It is in movement potentially, though, not actually. But what is potentially proceeds to actuality, and movement is the incomplete actualization of what is moveable.[797] The mover, on the other hand, is already in activity—for example, what is hot heats, and in general what has the form begets [something that has] it.[798] So [if a thing can move itself as a whole] the same thing will be hot and not hot at the same time in the same respect, and likewise in each of the other cases in which the mover and the moved must have the same name.[799] Therefore, one part of what moves itself is the mover and another part is the moved.

But that it is not self-moving in this way, namely, that each of the two parts is moved by the other, is evident from the following considerations. [1] For, first, there will be no first mover, if each part does move the other. (For the prior mover is more of a cause of the movement than what comes next in the series, and more of a mover. For we saw that there are two ways to move things, by being moved by something else and by being self-moved, and what is further from the last thing that is moved is closer to the starting-point of movement than what is intermediate.) [2] Further, it is not necessary for the part that is the mover to be moved except by itself. It is coincidental, therefore, if the other part moves it in return. We may take it, therefore, that it is possible for it not to move it. One part is moved, therefore, whereas the other is an immovable mover. [3] Further, it is not necessary for the mover to be moved in return. On the contrary, either it must move something while being immovable or it must be moved by itself, if indeed there must always be movement. [4] Further, a thing would be moved with the movement it causes, so that what heats would be heated.

[5] But then, no primary thing that moves itself has one or more parts each of which moves itself. For if the whole is moved by itself, it will either be moved by one of its parts or the whole will be moved by the whole. If, then, it is moved by some part being moved by itself, this part would be the primary self-mover (for separated it will move itself, whereas the whole will no longer do so). If, on the other hand, the whole is moved by the whole, it would be coincidental that the parts moved themselves. So, if it is not necessary that they do so, the case in which they are not moved by themselves may be taken. Of the whole [cause], therefore, one part will cause movement while being immovable, while the other will be moved. For only in this way will it be possible for something to be self-moved.

[6] Further, if indeed the whole moves itself, part will cause movement and part will be moved. AB will be moved, therefore, both by itself and by A alone. And since what causes movement may either be moved by something else or be immovable, and what is moved may either move something or move nothing, the self-mover must be composed of a part that is immovable but causes movement and further of a part that is moved but does not necessarily move anything, but may or may not do so. For let A be the part that causes movement but is immovable, and B the part that is moved by A and moves C, which is moved by B but moves nothing else (for even if C is in fact reached through several intermediates, let us suppose it is reached through only one). The whole ABC, then, moves itself. But if I take away C, AB will move itself, A causing movement and B being moved, whereas C will not move itself, or be moved at all. But then neither will BC move itself without A. For B causes movement by being moved by something else, not by being moved by any part of itself. Therefore, AB alone moves itself. It is necessary, therefore, for what moves itself to have a part that

causes movement but is immovable and a part that is moved but does not necessarily move anything, with either both parts making contact with each other, or one of the two with the other.[800] If, then, the mover is continuous (for what is moved must of course be continuous), each part will make contact with the other.[801] It is clear, then, that the whole moves itself not by a part being such as to move itself, but instead it moves itself as a whole, being moved and causing movement by part of it being the mover and part the moved. For it does not cause movement as a whole nor is it moved as a whole, instead it is A that causes movement and B alone that is moved.

A puzzle arises, however, if one takes something away either from A (if the immovable mover is continuous) or from B, the part which is moved, namely, will what remains of A cause movement or what remains of B be moved? For if so, AB would not be the primary thing that is moved by itself. For when something is taken away from AB, what remains of AB will still move itself. Or is it rather that nothing prevents either both parts or at any rate one part—the moved one—from being potentially divisible but actually undivided, if when divided it no longer has the same nature?[802] In that case, nothing prevents the primary self-mover from being in what is potentially divisible.

It is evident from these considerations, therefore, that the primary mover is immovable. For whether the series stops at once, because what is moved, but moved by something, is moved by the first immovable mover, or whether it is moved by something that moves itself and stops itself, in either case the primary mover of all moved things is immovable.[803]

VIII 6

Since there must always be movement without intermission, there must be something eternal, whether one or more than one, that first causes movement.[804] And what is a first mover must be immovable. Now whether each of the immovable movers is eternal is not relevant to the present argument, but that there must be something that is immovable and outside all change, both unconditionally and coincidentally, but which is capable of moving something else, will be clear if we investigate in the following way.

Let it be granted, then, if you wish, that in the case of certain things it is possible for them at times to be and at times not to be without any process of coming to be or passing away (for perhaps it is necessary, if something without parts at one time is and another time is not, that anything of that sort should, without undergoing any process of change, at one time be and another time not be).[805] And of the starting-points that are unmoving but can cause movement, let it also be possible for some of them to be at one time and not to be at another. Even so, this is not possible for all of them. For it is clear that there is some cause of the self-movers being at one time and not being at another. For everything that moves itself must have magnitude, if nothing without parts is in movement, but for the mover to have it is not at all necessary, given what we have said.[806]

That some things, then, come to be and some pass away, and that this happens continuously, of this no unmoving thing that is not eternal could be the cause, nor, again, could one that moves some things, while others move others.[807] For of the eternity and continuity neither each of them nor all can be the cause. For this state of things exists eternally and of necessity, whereas, though the sum of all those movers is unlimited, they do not all exist at the same time. It is clear, therefore, that even if some of the immovable movers and many of the self-movers pass away countless times, and others succeed them, and even if one thing that is immovable moves one thing while another moves another, nonetheless there is something that encompasses them all, and this, which is beyond each of them, is the cause of some things existing and others not, and of the continuous process of change. And this causes the movement of these other movers, while they cause the movement of the others.

If indeed, then, movement is eternal, the first mover will also be eternal, if there is just one. But if there are several, there will be several eternal movers. But we should believe that there is one rather than many, and a limited rather than an unlimited number. For when the consequences are the same, we must always take the limited number, since in things that are by nature what is limited and better must, if it is possible, be present to a higher degree.[808] And in fact one is enough, namely, the first of the immovable movers, which, being eternal, will be the starting-point of movement for the others.

It is also evident from the following considerations that the first mover must be something that is one and eternal. For it has been shown that there must always be movement. But if it always is, it must be continuous. For what always exists is continuous, whereas what is successive is not continuous.[809] But then if it is *continuous*, it is one. And it is one if the mover is one and what it moves is also one. For if the movement were to be caused by one thing, then by another, the whole movement will not be continuous but successive.

On the basis of these considerations, then, one may be convinced that there is some first immovable mover, and also by looking again at the starting-points [of the argument].[810] It is evident, accordingly, that there are some beings that are at times in movement and at times at rest. And because of this it has become clear that it is not the case either that all things are in movement or that all are at rest or that some things are always at rest and the others always in movement. For things that play a double game and have the capacity to be in movement and to be at rest show the truth about these alternatives. And since the existence of such things is clear to all, we wished to show the nature of the other two sorts of things, and show that there are some things that are always immovable and some things that are always in movement. Proceeding toward this end, and having established that everything that is moved is moved by something, and that this thing is either immovable or moved, and that, if it is moved, it is moved either by itself or by another at each stage, we advanced to the point of grasping that the starting-point of the movement of things that are in movement is, among moving things, the self-mover, but among all things, the immovable mover.[811] But we see that beings that move themselves are evidently of this sort—for example, the animate ones and the genus of animals.[812] And these in fact yielded the belief that perhaps it is possible for movement to come about without having existed previously at all, because we see this happening in these things (for at one time they are unmoving and then they are in movement once again, so it seems). But we must grasp the fact that animals move themselves with only one sort of movement, and that they do not in the strict sense cause it.[813] For the cause does not derive from the animal itself, but rather there are other natural movements inherent in animals, with which they do not move due to themselves, such as increase, decrease, and respiration, which each animal has while it is at rest and not moving with the movement that is due to itself. The cause of this is what encompasses the animal and many of the things that enter into it—for example, in some cases nourishment. For when nourishment is being concocted, animals sleep, and when it is being distributed [to the various parts] they wake up and move themselves, the first starting-point of movement being from outside, which is why they are not always in continuous movement due to themselves.[814] For the mover is something else, which is itself moving and changing in relation to each thing that moves itself.[815] In all these, however, the first mover and the cause of their self-movement is itself moved by itself, but coincidentally.[816] For the body changes its place, so that what is in the body does so as well, and moves itself by means of leverage.[817]

One the basis of these considerations, then, one should be convinced
that if something belongs among the things that are [intrinsically] 20
immovable but are themselves moved coincidentally, it is
incapable of causing continuous movement.[818] So if indeed there must
be continuous movement, there must be a primary mover that is not
moved even coincidentally, if there is to be, as we have said, an unceasing
and undying movement among the beings, and if being itself is to 25
remain in itself and in the same.[819] For if the starting-point remains
as it is, the universe must also remain as it is, since it is in continuous
relation to the starting-point. (But to be moved coincidentally by itself
is not the same as to be moved coincidentally by something else. For
to be moved coincidentally by something else belongs even to some
starting-points in the heaven, namely, those that are spatially moving 30
with several spatial movements, whereas to be moved coincidentally
by itself belongs only to things that pass away.[820])

Moreover, if there is in fact something that is always of this sort,
namely, moving something while itself remaining immovable and
eternal, then the first thing that is moved by it must be eternal as well.
Indeed, this is clear also from the fact that there would not be any **260^{b}1**
coming to be, passing away, or change with respect to other things
unless something that is in movement causes the movement. For the
immovable mover will always move things in the same way and with
one movement, seeing that it itself does not change at all in relation
to what it moves. But what is moved by something that, though it is 5
moved, is moved directly by what is immovable, because it is related
to things now in one way now in another, will not be the cause of the
same movement, but instead, because of being in contrary places or
forms, it will produce contrary movements in each of the other things
that it moves and cause it at one time to be at rest and at another time
in movement.[821] 10

It has become evident, then, from what we have said, what the
resolution is of the puzzle we raised at the start as to why it is that
all things are not either in movement or at rest, or why some are not
always in movement and the others always at rest, but instead some are
sometimes in movement and sometimes not.[822] For the cause of this is
now clear, namely, that some things are moved by an eternal immovable
mover, which is why they are always in movement, whereas some
things are moved by a moved and changing mover, so that they too 15
must change. But the immovable mover, as we said, seeing that it
remains simple, selfsame, and in the same, will move things with a
movement that is one and simple.

VIII 7

This will also be made more evident, however, if we make a new start where these issues are concerned. For we must investigate whether it is possible for any sort of movement to be continuous or not, and if it is possible, what sort it is, and which sort of movement is primary.[823] For if indeed there must always be movement, and if a particular sort is primary and continuous, it is clear that the primary mover causes this sort of movement, which must be one and the same, continuous and primary.

Since, though, there are three sorts of movement: that with respect to magnitude, that with respect to affection, and that with respect to place, it is this last, which we call spatial movement, that must be primary. For it is impossible for there to be increase without previous alteration. For what increases is in one way increased by what is like itself, but in another way by what is unlike itself. For contrary is said to nourish contrary. But everything gets added by becoming like to like.[824] It is necessary, then, for this change to a contrary to be an alteration.[825] But if there is in fact alteration, there must be something causing the alteration and making the actively hot from the potentially hot.[826] It is clear, then, that the mover is not always in the same situation, but sometimes closer, sometimes further away, from what is altered. But without spatial movement this cannot happen. If, therefore, there must always be movement, there must also always be spatial movement as the primary sort of movement, and if there is a primary sort and a posterior sort of spatial movement, there must always be the primary sort.

Further, the starting-point of all affections is condensation and rarefaction.[827] For heavy and light, soft and hard, hot and cold, seem to be sorts of density or rarity. And condensation and rarefaction are aggregation and disaggregation, in virtue of which substances are said to come to be and pass away. And things that aggregate and disaggregate must change with respect to place. But then the magnitude of what increases and decreases also changes with respect to place.

Further, it will be evident also from the following investigation that spatial movement is primary. For, as in the case of other things, so too in the case of movements, they are said to be primary in many ways. For what is said to be prior is that without which the other things will not exist, whereas it can exist without them, and there is also priority in time and with respect to substance.[828] So, since there must be movement continuously, and it would exist continuously either if it were continuous or if it were successive, but more so if it were continuous, and since it would be better for it to be continuous than successive, and we always suppose the better to exist in nature, if it is possible, and it is possible for movement to be continuous (this will be shown later; for now let us assume it), and since no other movement can be continuous except spatial movement, spatial movement must be primary.[829] For there is no necessity for what spatially moves either to increase or to alter, nor of course to come to be or pass away. But none of these other movements can exist without the existence of the continuous movement that the primary mover causes.

Further, spatial movement is primary in time. For this is the only sort of movement possible for eternal things. [It might be objected,] however, that for each particular thing that comes to be, spatial movement must be the last of its movements. For after a thing comes to be, first alteration and increase occur, whereas spatial movement is a movement that belongs to things that are already completed. But prior to this there must be something else that is in movement with a spatial movement, which will be the cause even of the coming to be of the things that come to be, though not itself coming to be (for example, what begets is the cause of what is begotten), although it might seem that coming to be is the primary sort of movement, because the thing must first come to be.[830] But though this is so in the case of any particular thing that comes to be, nonetheless there must be something in movement that is prior to the things that come to be, which does not itself come to be, and something else prior to this. And since coming to be cannot be primary (for then all things in movement would admit of passing away), it is clear that none of the movements that are next in order can be prior to spatial movement. By "the ones next in order" I mean increase, then alteration, decrease, and passing away. For all these are posterior to coming to be, so that if not even coming to be is prior to spatial movement, none of the other changes is either.

In general, it appears that what comes to be is incomplete and proceeds to a starting-point, so that what is posterior in order of coming to be is prior in nature.[831] And spatial movement is the last sort to belong to all the things that are coming to be. That is why some living things are entirely without movement due to a lack of the [requisite] instrumental part, such as plants and many genera of animals, while movement belongs to others when they are becoming complete.[832] So if spatial movement belongs more to the things that have more fully achieved their due nature, this sort of movement would also be prior to the others with respect to substance, both because of the foregoing considerations and because what is moved in a spatial movement departs less from its substance than in any other sort of movement. For it alone does not at all change what it is, whereas what is altered changes its quality, and what increases and decreases changes its quantity. Above all it is clear that this movement—movement with respect to place—is the movement of that what moves itself most of all causes in the strict sense. And yet it is this—what moves itself—that we say is the starting-point of things that are moved and of things that are movers and is primary among things moved.

It is evident from these considerations, therefore, that spatial movement is the primary sort of movement. But we must now show what sort of spatial movement is primary. At the same time, though, the truth of the assumption we made both just now and previously—namely, that it is possible for there to be a movement that is continuous and eternal—will be evident from this same methodical inquiry.[833]

Now that none of the other sorts of movement can be continuous is evident from what follows. For all movements and changes are from opposites to opposites—for example, of coming to be and passing away, being and not being are the defining marks; of alteration, they are the contrary affections; and of increase and decrease, they are greatness and smallness, or complete and incomplete magnitude.[834] And the movements to contraries are contrary ones. But what is not always in movement with a certain movement, though it existed previously, must previously have been at rest. It is evident, then, that what changes will be at rest in the contrary. It is likewise too in the case of changes.[835] For passing away and coming to be, whether unconditionally or a particular sort in relation to a particular sort, are opposites.[836] So, if it is impossible for something to be changing in opposite ways at the same time, change will not be continuous, but there will be an interval of time between these opposed changes. For it makes no difference whether contradictory changes are contrary or not (for this is not being used in the argument), as long as they cannot be present in the same thing at the same time. Nor does it make a difference if it is not necessary for the thing to be at rest in the contradictory state, or if change is contrary to rest (for presumably a non-being cannot be at rest, and passing away is change to non-being), but only whether there is a time interval between the opposed changes. For that way the change is not continuous. For even in the previous cases the contrariety [of the states] was not the useful thing; the impossibility of their belonging at the same time was.

Nor need one be troubled by the fact that the same thing will have more than one contrary—for example, that movement is contrary to rest and to movement to the contrary. We have to grasp only this: that in a way movement is opposed both to the contrary movement and to rest, just as the equal and the moderate are

opposed both to what exceeds it and what is exceeded by it, and that
it is not possible for opposites, whether movements or changes, to 20
be present at the same time. Further, in the case of coming to be
and passing away it would seem to be entirely absurd if what had
come to be must pass away immediately without remaining for any
interval of time. So on the basis of these changes one should be
convinced with respect to the others, since it is natural for what is
similar to hold in all cases. 25

VIII 8

We are now in a position to state that it is possible for there to be
an unlimited movement that is one and continuous, and that this
is movement in a circle. For everything that is in spatial movement
moves either in a circle, in a straight line, or in a mixture of the two,
so that if one of the former two is not continuous, the combination
of both cannot be continuous either. Now it is clear that what 30
is in spatial movement in a limited straight line is not in continuous
spatial movement.[837] For it turns back, and what turns back in
a straight line is moved with contrary movements. For with respect
to place, up is contrary to down, forward to backward, left to right, 35
since these are the contrarieties of place. But we have previously
determined what the one and continuous movement is, namely,
that it is the movement of one thing, in one interval of time, and in 262^{a}1
something undifferentiated with respect to species.[838] For we saw
that there were three things: the thing in movement (for example, a
human or a god), when it moves (that is, the time), and third what
it is in (and this is place, affection, species, or size).[839] But contraries
differ in species and are not one; the differentiae of place being those 5
we mentioned. And a sign that movement from A to B is contrary
to movement from B to A is the fact that they stop or pause each
other if they occur at the same time. And likewise in the case of a
circle—for example, movement from A clockwise to B is contrary to
movement from A counterclockwise to C (for they stop each other,
even if they are continuous and do not turn back, because contraries 10
destroy and prevent each other), whereas lateral movement is not
contrary to upward movement.[840]

It is most of all evident, however, that movement in a straight line
cannot be continuous from the fact that what turns back must stop,
not only if it is moving in a straight line, but even if it is spatially
moving in a circle. For spatially moving in a circle is not the same 15
as circular movement. For at one time what moves in a circle is in

connected movement, whereas at another time it turns back again to the same point from which it began. One may be convinced that such movement must come to a stop not only on the basis of perception but also on the basis of argument.[841] We may start with this. For when there are three things, starting-point, mid-point, and end-point, the mid-point is both end-point and starting-point in relation to the other two, and is one in number, but two in account.[842] Further, potentially is distinct from actively.[843] So any point between the extremes of a straight line is potentially a mid-point, but not actively so, unless what is in movement divides the line there by coming to a standstill and starting to move again. In this way the mid-point becomes starting-point and end-point—a starting-point of the later part, and an end-point of the first part (I mean, for example, if in its spatial movement A comes to a standstill at B and then travels again to C). But when its spatial movement is continuous, A cannot either have arrived at or have departed from point B, but can only be there in a now, and not in any interval of time except the one in which that now marks a division, namely, the whole time. But if someone were to grant that it has arrived and has departed, A will always be at a stop when it is in spatial movement. For it is impossible for A to have arrived at and to have departed from B at the same time. It will do so, therefore, at distinct points of time. Therefore, there will be a time interval between them. So A will be at rest at B, and similarly at the other points, since the same argument will apply to each. But whenever the thing in spatial movement A uses the mid-point B as both end-point and starting-point, it must be at a standstill, because of making it be both, just as one might also do by understanding it that way.[844] But A is the point it has departed from as a starting-point, and C is the one it arrives at when it reaches the end-point and comes to a standstill.[845]

That is why we should also state this in response to the following puzzle. For if line E is equal to line F, and A is in continuous spatial movement from the extremity E to C, and A is at point B at the same time as D is in spatial movement from the extremity F to the other extremity G in a uniform way and with the same speed as A, D will arrive at G before A arrives at C. [Fig. 1]

For what started and departed earlier must arrive earlier. Therefore, A has not arrived at and departed from B at the same time, and that is why it lags behind. For if it does so at the same time, it will not lag behind; on the contrary, to lag behind it must come to a standstill.[846] We must not grant, therefore, that at the time A arrived at B, D was at the same time in movement from F (for if A has arrived at B, its departure will also have occurred, and not at the same time), but it was there in a temporal instant and not in a 20 temporal interval.

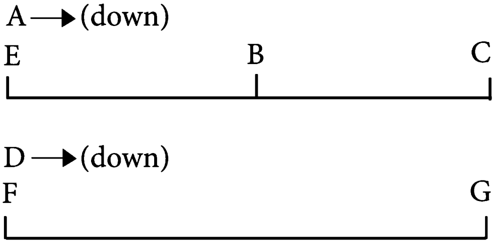


Fig. 1

In this case, then, where movement is continuous, it is impossible to speak this way. In the case of something that turns back, however, it is necessary to speak this way. For if G spatially moves to D and, turning back, spatially moves back down again, it has used the extremity D as both an end-point and a starting-point, one point as two. That is why 25 it must be at a standstill, and has not arrived at and departed from D at the same time, since then it would be there and not there in the same now. But then we surely cannot state the same resolution over again. For it is not possible to state that G is at D in an instant, and that it has not arrived at or departed from it. For it must arrive at an actual 30 end-point, not a potential one. For points in the middle are potential, whereas this one is actual, and an end-point from below, a starting-point from above—related to the movements [of D], therefore, in the same ways. What turns back along a straight line must, therefore, come **263ᵇ1** to a standstill. Therefore, it is not possible for continuous movement in a straight line to be eternal.

One must reply in the same way to those who pose Zeno's argument and ask whether one must always traverse the half, but these halves are 5 unlimited in number, and it is impossible to traverse what is unlimited. Or to those who pose the same argument in another way and require that during the movement we count the half movement before the whole as we come to each halfway point, so that in traversing the whole it comes about that we have counted an unlimited number. And this is admittedly impossible.

Now in our first accounts concerned with movement we resolved [this puzzle] due to time having unlimited parts within itself.[847] For nothing absurd follows if in an unlimited time one traverses unlimited parts. And the unlimited is present as much in the time as in the length. But though this resolution is adequate relative to the questioner (for the question is whether in a limited time it is possible to traverse or count unlimited things), relative to the thing and the truth it is not adequate. For if someone sets aside the issue of length and the question of whether in a limited time one can traverse an unlimited number of things and inquires about the time itself (for the time is divisible without limit), this resolution will no longer be adequate. But it is the truth that must be stated, namely, just the one that we stated in our accounts just now.[848] For if someone divides a continuous line into two halves, he treats one point as two, since he makes it both a starting-point and an end-point. And both counting and dividing in half make it this way. And if one divides in this way, neither the line nor the movement will be continuous. For continuous movement is over a continuum, and in a continuum there is an unlimited number of halves, not in actuality, however, but in potentiality. But if one makes them actual, one will not make the movement continuous, but rather come to a standstill, which is evidently just what happens when one counts the halves, since one must count one point twice. For the end-point of one half will be the starting-point of the other, if one does not count the continuous line as one, but as two halves. So one must reply to the question of whether it is possible to traverse unlimited things either in time or in length that in one way it is, and in another way it is not. In the case of actually unlimited things it is not possible, in the case of potentially unlimited ones it is possible. For a thing moving continuously has coincidentally traversed unlimited things, whereas unconditionally it has not. For a line is coincidentally an unlimited number of halves, but its substance or its being is something else.

It is also clear that unless one posits that the point of time that divides earlier from later always belongs to the later so far as the thing is concerned, the same thing will both be and not be at the same time, and when it has come to be it will not be. The point, though, is common to both, that is, to both the earlier and the later, and is the same and one in number, though not the same in account, since it is end-point of one and starting-point of the other. But so far as the thing is concerned it always belongs to the later affection. Let the time be

ACB, and the thing D, which is white in time A and not white in time 15
B. At time C, therefore, it is white and not white. For it is true to say
that it is white in any time in A, if it was white in all this time, and in
B that it is not white. But C is in both times. Therefore, we must not
grant that it is white in all of A, but rather at all times except the last
now, which is C. And this already belongs to the later period.[849] And 20
if not white was coming to be and white passing away in all of A, not
white has come to be and white has passed away at C. So this is the
first time at which it is true to say that the thing is white or that it is
not white.[850] Otherwise, at the time it has come to be the white will
not exist and at the time it has passed away it will exist. Alternatively,
it must be white and not white at the same time, and in general must
be and not be. 25

But if whatever exists without having previously existed must come
to be, and if when it is coming to be, it does not exist, time cannot
be divisible into indivisible times. For if D was coming to be white
in time A, and has at once come to be white and is white in another
indivisible but contiguous time B (if D was coming to be white in A, it
was not white, but it is white in B), there must be an intermediate coming 30
to be, so that there must also be a time in which D was still coming
to be white. The same argument does not apply, though, to those 264^{a}1
who say that there are no indivisible times, but that D has come to be
and is white at the extreme point, with which nothing is contiguous
or successive. But indivisible times are successive.[851] And it is evident
that if D was coming to be white in the whole time A, there is no time
in which it has come to be white and was coming to be white that is 5
greater than the whole time in which it only was coming to be white.[852]

By these and other such arguments, which properly belong to the
subject, one may be convinced. But the result would seem to be the
same if we investigate the issue logico-linguistically as follows.[853] For
everything that is in movement continuously, if it is not knocked aside
by anything else, then the very point it arrived at by its spatial movement 10
is the one it was previously spatially moving toward—for example,
if something arrived at B, it was spatially moving toward B, and
not merely when it was in the neighborhood of B, but as soon as it
started to move. For why would it be doing so now rather than previously?
And similarly in the case of the other [sorts of movement and
change]. Suppose, then, that what is in spatial movement away from A,
when it arrives at C, will again return to A with a continuous movement. 15
At the time, therefore, that it is spatially moving from A toward
C, it is also spatially moving to A with a movement that is from C, so
that it will have contrary movements at the same time. For movements

in contrary directions along a straight line are contraries. At the same
time, it will also be changing from what it is not at [namely, C]. If,
then, this is impossible, it must come to a standstill at C. Its movement,
20 therefore, is not one movement, since a movement that is interrupted
by a stop is not one movement.

Further, this is also evident, as a more universal point about all sorts
of movement, from the following considerations. For if everything that
is in movement is moved with one of the sorts of movement already
mentioned and is at rest with the opposite sort of rest (for we saw that
there are no others beyond these), what does not always move with
25 this sort of movement (I mean the ones that are distinct in species,
not if some part of the whole is) must previously have been at rest in
the opposite state of rest.[854] If, then, movements in contrary directions
along a straight line are contraries and it is not possible to be in contrary movements at the same time, what is in spatial movement from
30 A to C would not at the same time be in spatial movement from C to
A. And since it is not in both spatial movements at the same time, but
will move with the latter movement, it must be at rest at C. For this
is the sort of rest that is opposite to the movement from C. It is clear,
therefore, from these considerations that the movement will not be
continuous.

264^{b}1 Further, there is also this argument, which more properly belongs
to the topic than the aforementioned ones. For suppose that the not
white has passed away at the same time as the white has come to be.[855]
If, then, the alteration to white and from white is continuous and the
white does not remain white for some time, at the same time as the not
5 white has passed away the white has come to be and the not white has
come to be, since the time of the three will be the same.

Further, if time is continuous, it does not follow that movement
is continuous, but that it is successive. And how could the extreme
point of contraries—for example, of whiteness and blackness—be the
same?[856]

A circular movement, on the other hand, will be one and continuous. For nothing impossible follows. For what is moving from A will at
10 the same time be moving to A with the same proposed end (since what
it will arrive at is what it is moving to), but without having contrary
or opposite movements at the same time. For not every movement
to A is contrary or opposite to a movement from A, but rather they
are contrary only if they are along a straight line (for it has contraries
15 with respect to place, such as the extremities of a diameter, since they
are furthest apart), and opposite if they are along the same line.[857] So
there is nothing to prevent the movement from being continuous and

without temporal intermission. For circular movement is movement from a point to itself, whereas movement along a straight line is from a point to another.

Also, circular movement is never in the same things, whereas rectilinear movement is repeatedly in the same things.[858] Now it is possible 20 for what repeatedly comes to be now in one thing now in another to move continuously, but it is not possible for what always comes to be in the same things. For then it would of necessity have contrary movements at the same time. So it is not possible for a thing to move continuously in a semicircle or in any other arc. For it would of necessity 25 make the same movement repeatedly and change to contrary changes. For the starting-point and limit are not united, whereas in circular movement they are, and it alone is complete.[859]

It is evident from this division that none of the other sorts of movements can be continuous either. For in all the others we find the same things being traversed repeatedly—for example, in alteration there are 30 the intermediate stages, in quantitative change, the intermediate magnitudes, and in coming to be and passing away it is the same way. For it makes no difference whether we make the stages in the change few or many, or whether we add or subtract a stage in between, in either case **265^a1** we find the same things being traversed repeatedly.

It is clear, then, from these considerations that those physicists who claim that all perceptible things are always in movement do not speak well, since things must move with one of these sorts of movement, and especially, according to them, alteration. For things are always in 5 flux, they say, and in decay, and furthermore they speak even of coming to be and passing away as alteration.[860] The present argument, by contrast, states universally that it is not possible to move continuously with any sort of movement except in a circle, so that nothing can do so either with alteration or with increase.

Let so much be said by us, then, to show that there is neither unlimited nor continuous change except for circular spatial movement. 10

VIII 9

And it is clear that circular spatial movement is the primary sort of spatial movement. For every spatial movement, as we said earlier, is either circular, rectilinear, or a mixture of the two.[861] And the first two must be prior to the last, since it is composed of them. And the 15 circular is prior to the rectilinear, since it is simpler and more complete. For a straight line that is unlimited cannot be traversed, since such an unlimited straight line does not exist.[862] And even if it did, nothing would traverse it, since the impossible does not happen, and it is impossible to traverse an unlimited line. But in the case of movement along a limited line, if it turns back, it is composed of two movements, while if it does not turn back, it is incomplete and capable of passing away. And the complete is prior to the incomplete, in nature, in account, and in time, and what is incapable of passing away to what is capable of passing away.[863]

Further, what can be eternal is prior to what cannot be eternal. But in fact circular movement can be eternal, but none of the other sorts, whether of spatial movement or of any other sort whatsoever, can be so, since rest must occur, and if rest occurs, the movement has passed away.

And it is reasonable that circular movement should be one and continuous, and that rectilinear movement should not. For of movement along a straight line there is a definite starting-point, end-point, and mid-point, which are all contained in it in such a way that there is a point from which what is in movement will start and a point at which it will end (for everything is at rest at the limits, whether the one from which it moves or the one to which), but of movement along a circular line they are indefinite. For why should any point on the line be a limit more than any other? For each point is alike a starting-point, a mid-point, and an end-point, so that what is in movement is always at the starting-point and at the end-point and also never at them. This is why a revolving sphere is in a way both in movement and at rest. For it occupies the same place. The cause is that all these features belong to the center-point, since it is starting-point, mid-point, and end-point of the magnitude.[864] So, because this point is outside the circumference, there is nowhere for the spatially moving [sphere] to rest as if it has traversed its course (for it is always spatially moving around a mid-point but not to an extreme one), and because of this, the whole is in a way always at rest and remains, and is also always in continuous movement.[865] And there is this reciprocal relation. For because the revolution is also the measure of movements, it must be primary (for everything is measured by what is primary), and because it is primary, it is the measure of the other sorts of movement.[866]

Further, only circular movement can be regular.[867] For things in rectilinear movement move spatially in an irregular way from the starting-point and to the end-point, since the further everything removes itself from its resting point, the faster is its spatial movement. Circular movement, on the other hand, alone has neither starting-point nor end-point naturally within itself, but rather has them outside.[868]

The fact that spatial movement with respect to place is the primary sort of movement is attested by all those thinkers who have made mention of movement. For they all assign the starting-points of movement to things that cause movement of this sort. For aggregation and disaggregation are movements with respect to place, and it is in this way that love and strife move things, since strife disaggregates and love aggregates them.[869] And the [divine] understanding, Anaxagoras says, disaggregates things as the first cause of movement.[870] The same is true of those who mention no cause of this sort but say that things are in movement because of the void.[871] For they too say that nature is moved with movement with respect to place (for movement because of the void is spatial movement and, as it were, in place), and they think that none of the other movements belongs to the primary things but only to their compounds.[872] For they say that increase and decrease and alteration result from the aggregation and disaggregation of the indivisible bodies. It is the same way too with those who make condensation and rarefaction the cause of coming to be and passing away, since they regulate these by aggregation and disaggregation.[873]

Further, beyond these there are those who make soul the cause of movement.[874] For they say that what moves itself is the starting-point of all things that are in movement, and an animal and every animate thing moves itself with movement with respect to place.[875]

Also, we say that only what is in movement with respect to place is **266a1** in movement in the strict sense; if it remains at rest in the same place, but increases or decreases or happens to alter, it is in movement in a way, but we do not say that it is in movement unconditionally.

It has been stated, then, that there always was and always will be movement throughout all time; what the starting-point of eternal movement is; further, what the primary movement is; what sort of movement can alone be eternal; and that the primary mover is immovable.

VIII 10

Let us now say that this mover must be without parts and without magnitude, after first determining some prior issues concerning it. And one of these is that no limited thing can cause movement for an unlimited time. For there are three things: the mover, the moved, and third, that in which, namely, time. And these are either all unlimited, all limited, or some are limited—that is, two or one. Let, then, A be the mover, B the moved, and C the unlimited time. Then let D move some part E of B. Not, then, in a time equal to C, since the greater movement takes more time. So F, the time of the movement, is not unlimited. Now by adding to D I shall use up A, and by adding to E I shall use up B. But I shall not use up the time by always taking a corresponding amount from it, since it is unlimited. So all of A will move the whole of B in a limited time period of C. It is not possible, therefore, for an unlimited movement to be due to a limited mover.

It is evident, then, that a limited magnitude cannot cause movement for an unlimited time. And that in general an unlimited capacity cannot be present in a limited magnitude will become clear from the following considerations. For let the greater capacity be the one that always produces an equal effect in a shorter time, as in the case of heating, sweetening, or throwing, in fact, of causing movement in general. What is affected, therefore, must undergo some effect due to the limited magnitude that has an unlimited capacity, and an effect greater than one due to any other. For the unlimited one is greater than any other. But then this cannot take any time at all. For if A is the time in which an unlimited strength heated or pushed something, whereas in time AB some limited one did so, by continually adding to this strength a greater limited one I shall eventually have caused the movement in question in time A. For by continually adding a limited quantity I shall exceed every definite quantity, and by subtracting, fall short of any definite one in like manner. The limited capacity, therefore, will cause a movement in a time equal to that taken by the unlimited one. But this is impossible. No limited thing, therefore, can have an unlimited capacity.

Neither, moreover, can a limited capacity be present in an unlimited magnitude. And yet it is possible for a greater capacity to be present in a lesser magnitude. True, but a still greater capacity can be present in a greater magnitude. Let AC, then, be an unlimited magnitude. Then [a part of it] BC has a certain capacity, which in a certain time caused D to move—namely, in time t_1t_3. If, then, I take twice BC, it will cause the movement in half the time (assuming this to be the proportion), so that it will cause [D] to move in half the time, namely, t_2t_3.[876] Therefore, by always taking in this way I shall never exhaust AC, whereas I shall always be taking a smaller part of the given time. The capacity, therefore, will be unlimited. For it exceeds every limited capacity, if at any rate every limited capacity must also take a limited time to do what it does (for if such-and-such capacity takes such-and-such time, a greater capacity will cause the movement in a shorter but still definite time that is inversely proportional to the capacity). But a capacity must always be unlimited—just as a number or a magnitude is—if it exceeds every definite one. This may also be shown in the following way. For if we take a certain capacity, the same in genus as the one in the unlimited magnitude, but this one being in a limited magnitude, it will be commensurable with the limited capacity in the unlimited magnitude.

It is clear from these considerations, then, that it is not possible for an unlimited capacity to be present in a limited magnitude, nor for a limited capacity to be present in an unlimited one. But where spatial movements are concerned it will be well to go through a puzzle first. For if everything in movement is moved by something, that is, the ones that do not move themselves, how is it that some will move continuously even when they are not in contact with their mover—for example, projectiles? And if the mover at the same time moves something else, such as the air, which causes movement by being moved, it is likewise impossible for it to be in movement when the first mover is not in contact with and moving it—on the contrary, all the things will be in movement at the same time and will stop whenever the first mover stops, even if, like the magnet, it makes what it has moved capable of causing movement.

We must, then, say this: that the first mover makes the air, water, or whatever naturally moves or is moved, capable of causing movement. However, this does not at the same time stop moving and stop being moved, but rather it stops being moved at the same time as its mover stops moving it, but it still causes movement, which is why it moves something else contiguous to it, and the same account applies to the latter. But it begins to stop whenever the capacity to cause movement becomes less in each contiguous thing. And it finally stops when the previous one no longer makes the next one a mover, but only something moved. And these things, the mover on the one hand and the moved on the other, must stop at the same time, as must the whole movement. Now this movement comes to be in things that admit of being at one time in movement and at another time at rest, and it is not continuous, though it appears to be. For it occurs either in successive things or in things making contact, since there is not one mover, but movers contiguous to each other. That is why in air and in water this sort of movement occurs, the sort that some people call "reciprocal replacement." But it is impossible to resolve the puzzles raised in any other way than the aforementioned one. For in reciprocal replacement everything would at the same time produce movement and be in movement, and so also stop at the same time. But as things stand it is evident that there is one thing in continuous movement. What, then, is it due to? For it is not due to the same thing [that started it moving].

Since among the beings there must be continuous movement, and this is one movement, it must be a certain magnitude's one movement (for what is without magnitude does not move), it must be of one thing and due to one thing (for otherwise it will not be continuous, but rather a series of movements contiguous to each other and divided).[877] The mover, then, if it is one mover, will cause movement either by being moved or by being immovable. If, then, it is moved, it will itself have to follow along and undergo change, and at the same time be moved by something, so that the series will stop when it will arrive at a movement that is due to something immovable. For this of necessity does not undergo change along with the others, but will always be capable of causing movement (for to cause movement in this way involves no labor), and this movement is regular, either alone or more so than any other.[878] For the mover is never subject to any change. And neither must what is moved be subject to any change in relation to the mover, if its movement is to remain the same. It is necessary, then, for the mover to be either at the center or on the circumference of a circle. For these are its starting-points.[879] But the things closest to the mover move fastest. And such is the movement of the circumference. That, therefore, is where the mover is.

There is a puzzle, though, as to whether it is possible for anything in movement to cause movement, but not like something that pushes again and again, where [the movement caused is] continuous by being successive.[880] For such a mover must either always push or pull or both, or another thing must receive one from another and again another mover, as was mentioned a moment ago in the case of projectiles, if the air, being divisible, causes movement by one part always being moved after another.[881] In either case there cannot be one movement, but a contiguous series. The only continuous movement, therefore, is that which the immovable mover causes. For it always remains in the same state and so will continuously stand in the same relation to what it moves.

Now that these points are determined, it is evident that it is impossible for the first and immovable mover to have any magnitude. For if it has magnitude, this must be either limited or unlimited. But that there cannot be an unlimited magnitude was shown previously in the *Physics*, and it has been shown just now that a limited magnitude cannot have an unlimited capacity, and that something cannot be moved for an unlimited time by a limited magnitude.[882] But the primary mover causes eternal movement for an unlimited time. It is evident, therefore, that it is indivisible and without parts, and has no magnitude.

APPENDIX

VII 3 (alternate text)[883]

245^{b}19 That all things that are altered are altered due to perceptibles, and that
there is alteration only of those things that are intrinsically affected by
these, is a fact that we may get a theoretical grasp on from the following
21 considerations. For of the others, it seems that alteration belongs most
of all to figures and shapes, and in states, that is, in losing or acquiring
23 them. But it does not exist in these either. Instead these come to be
when something is altered (for example, when the matter is condensed
25 or rarified, heated or cooled); but this is not alteration. For we do not
say that the shape [produced] is that from which the shape of the statue
is composed, nor that it is the matter from which the candle or the bed
27 is composed, but using a paronym, we say that the first is brazen, the
second waxen, and the third wooden. On the other hand, we do say
this of the things that undergo alterations. For we say that the bronze
29 is wet, hot, or hard (and not only in this way, but also that the wet and
246^{a}21 the hard are bronze), speaking homonymously of the matter by using
the [name of] the affection. Since, then, that from which the shape
and the figure and the thing that comes to be are not things that what is
23 shaped from them is homonymously said to be, whereas what undergoes alteration is homonymously said to be the affections, it is evident
that alteration occurs only in perceptibles.

25 Further, it would also be absurd in another way. For to say that a
human being or a house that has achieved its end has been altered is
ridiculous, that is, if we say that the completion of the house, namely,
27 its receiving its coping-stone or roof-tile, is an alteration, or that the
house is altered when it is coped or tiled. It is clear, then, that alteration
is not found in things coming to be.

29 Nor does it occur in states. For states are virtues and vices, but every
virtue or vice is in [the category of] relation, just as health is a sort of
246^{b}21 proportion of hot and cold things, either those within or in relation
to what encompasses it. Likewise, beauty and strength are in [the category of] relation. For they are certain dispositions of the best part in
23 relation to the best good. And by "best" I mean what preserves and disposes according to nature. Since, then, both virtues and vices belong in
[the category of] relation, and these are not comings to be, nor is there
25 a coming to be of them, or any alteration of them at all, it is evident that
there is no alteration at all where states are concerned.

Nor, then, is there any alteration where the virtues and vices of the
soul are concerned. For virtue is a sort of completion (for each thing is 27
most complete at the time when it reaches its own proper virtue, and is
most in accord with its nature, just as a circular thing is most in accord
with its nature when it is most a circle), whereas vice is the passing 29
away of and departure from these completions.

Now both the acquisition of virtue and the loss of vice occur because **247ᵃ20**
something is altered, however, neither of these is an alteration. But that
something is altered is clear. For virtue is a sort of being unaffected or
being affected in such-and-such a way, whereas vice is being affected
or being affected contrary to virtue. And virtue of character as a whole
happens to be found in pleasures and pains. For pleasure is either in 23
accord with activity or because of memory or due to expectation. If
it occurs in activity, the cause is perception, if because of memory or
expectation, it is due to the same thing. For pleasure occurs either 25
when we remember how we were affected or when we expect to be
affected in the future.

But then no alteration belongs to the thought-involving part of the
soul either. For we speak of what has scientific knowledge as belonging 27
mostly in [the category of] relation. And this is clear. For scientific 29
knowledge does not come to be in those who have a capacity to be
moved, but is due to the presence of something. For we acquire scientific
knowledge of the universal from the experience of particulars. Nor, **247ᵇ20**
then, is the activity [of using scientific knowledge in contemplating
something] a coming to be, unless someone were to say that opening
one's eyes or touching something was a coming to be. For the activity
is like this. But the acquisition of scientific knowledge at the start is not
a coming to be or an alteration. For it is when the soul comes to a rest
and a settling down that someone comes to be a scientific knower and 23
a practically-wise person.

Likewise, if someone who wakes up from sleeping, sobers up from
drinking, or recovers from sickness did not become a scientific knower,
even though before he was not capable of using or activating his scientific
knowledge, as soon as he is freed from his restlessness and his
thought has come to a rest and a settling down, the capacity to use his 25
scientific knowledge belongs to him. This is the sort of thing, then, that
also comes about when scientific knowledge is acquired at the start,
namely, a sort of calming of the restlessness and a coming to a stop. 27

Children, accordingly, are neither capable of learning nor of discerning
by means of the perceptual capacities as well as their elders
are, since the disturbance and movement [in their souls] is great. But 29
it settles down and comes to rest sometimes due to nature sometimes

248a26 due to other causes. But in both cases it happens that something is altered, just as happens in relation to the activity when someone wakes
27 up or sober up.

It is evident, then, that alteration occurs in perceptibles and in the
248b26 perceptual part of the soul, and in nothing else except coincidentally.

Notes

Book I

Note 1

In all methodical inquiries in which there is knowledge (*eidenai*), **that is, scientific knowledge** (*epistasthai*), **of things that have starting-points, causes, or elements, it comes from knowledge** (*gnôrizein*) **of these:** Although there may be little difference between *gnôsis* and *epistêmê* (verb: *epistasthai*), *epistêmê* is usually applied only to demonstrative sciences, crafts, or other bodies of systematic knowledge, so that *epistêmê* is specifically *scientific* knowledge. *Gnôsis* is weaker and is used for perceptual knowledge and knowledge by acquaintance—something familiar is *gnôrimos*.

Scientific knowledge (*epistêmê*): (1) In the *Physics* the term *epistêmê* is typically reserved for the scientific knowledge that is provided by the theoretical sciences (Introduction, pp. xxii–xxiii). To understand what a science of this or any sort is like we must begin a few steps back.

(2) A statement (*logos apophantikos*) is the true (or false) predication of a single predicate term A of a single subject term B, either as an affirmation (*kataphasis*) (A belongs to B) or a denial (*apophasis*) (A does not belong to B) (*Int.* 5, 8). What makes a term a single subject term, however, is not that it is grammatically singular or serves as a grammatical subject but that it designates a substantial particular—a canonical example of which is a perceptible matter-form compound, such as Socrates. Similarly, what makes a term a predicate is that it designates a universal (man, pale)—something that can have many particular instances. When the role of predicate is restricted to universals, therefore, while that of subject is left open to both particulars and universals, it is more on ontological or metaphysical grounds than on what we would consider strictly logical ones. Subjects and predicates are thus ontological items, types of beings, rather than linguistic or conceptual ones, and logical principles, such as PNC, are very general ontological principles, truths about all beings as such, or qua beings. Particular affirmations (Socrates is a man) and general affirmations (Men are mortal) have the same subject-predicate form, but when the subject is a universal, the affirmation may itself be either universal (All men are mortal) or particular (Some men are mortal)—that is to say, the predicate may be affirmed (denied) of the subject either universally (*katholou*) or in part (*kata meros*) or, if the quantifier is omitted (Men are mortal), indefinitely (*adioristos*). General affirmations, as a result, which are the only ones of interest to science (*Met.* VII 15 1039^b27–31), are of four types: A belongs to all B (**a**AB), A belongs to no B (**e**AB), A belongs to some B (**i**AB), A does not belong to all B (**o**AB).

(3) A *science* is a state of the soul that enables its possessor to give demonstrative explanations—where a demonstration (*apodeixis*) is a special sort of deduction (*sullogismos*) from scientific starting-points and a deduction is "an argument in which, certain things having been supposed, something different from those supposed things necessarily results because of their being so" (*APr.* I 2 24^{b}18–20). The things supposed are the argument's premises; the necessitated result is its conclusion; all three are affirmations of one of the four types we looked at. In Aristotle's view, such deductions are *syllogisms* (*sullogismos*, again) consisting of a major premise, a minor premise, and a conclusion, where the premises have exactly one "middle" term in common, and the conclusion contains only the other two "extreme" terms. The conclusion's predicate term is the *major term*, contributed by the major premise; its subject is the *minor term*, contributed by the minor premise. The middle term must be either subject of both premises, predicate of both, or subject of one and predicate of the other. The resulting possible combinations of terms yield the so-called figures of the syllogism:

	First figure		Second figure		Third figure	
	Predicate	Subject	Predicate	Subject	Predicate	Subject
Premise	A	B	A	B	A	C
Premise	B	C	A	C	B	C
Conclusion	A	C	B	C	A	B

Systematic investigation of the possible combinations of premises in each of these figures results in the identification of the *moods* or modes that constitute valid deductions. In the first figure, these are as follows:

<table>
<tr><th>Form</th><th>Mnemonic</th><th>Proof</th></tr>
<tr><td>aAB, aBC | aAC</td><td>Barbara</td><td>Perfect</td></tr>
<tr><td>eAB, aBC | eAC</td><td>Celarent</td><td>Perfect</td></tr>
<tr><td>aAB, iBC | iAC</td><td>Darii</td><td>Perfect</td></tr>
<tr><td>eAB, iBC | oAC</td><td>Ferio</td><td>Perfect</td></tr>
</table>

A mood is perfect when there is a proof of its validity that is *direct*, in that it does not rely on the validity of any other mood. Only first figure syllogisms have perfect moods.

(4) Besides their logical interest as admitting of direct proof, perfect syllogisms in Barbara are also of particular importance to science. First, because "syllogisms that give the reason why, which hold either universally or for the most part, in most cases are carried out through this figure. That is why it is the most scientific of all; for getting a theoretical grasp on the reason why is most important for [scientific] knowledge" (*APo.* I 14 79^{a}20–24). Second, "only through this figure can you hunt

for scientific knowledge of something's essence" (79^a24–25): essences hold universally, only perfect syllogisms in Barbara have universal conclusions, and definitions of essences, which are scientific starting-points, must hold universally.

(5) Specifically scientific starting-points are of just three types (*APo.* I 10 76^a37–$^b22$). Those *special* to a science are definitions of the real (as opposed to nominal) essences of the beings with which the science deals (II 3 90^b24, II 10 93^b29–94^a19). Because these are definitions by genus and differentia (II 13 96^a20–97^b39), a single science must deal with a single genus (*APo.* I 7 75^b10–11, I 23 84^b17–18, 28 87^a38–39). Other starting-points (so-called axioms) are common to all or many sciences (*APo.* I 2 72^a14–24, I 32 88^a36–$^b3$). A third sort of starting-point posits the existence of the genus with which the science deals, but this may often be left implicit if the existence of the genus is clear (I 10 76^b17–18). The source of these starting-points, in turn, is perception and experience, which lead by induction to a grasp by understanding of them: "From perception memory comes to be, and from many memories of the same thing, experience. For, then, memories that are many in number form one experience. And from experience, or from the whole universal that has come to rest in the soul (the one over and above the many, this being whatever is present as one and the same in all of them), comes a starting-point (*archê*) of craft knowledge and scientific knowledge—of craft knowledge if it concerns coming to be (*genesis*), of scientific knowledge if it concerns being" (*APo.* II 19 100^a3–9).

(6) To constitute a *demonstration* a deduction must be a valid syllogism in the mood Barbara, whose premises meet a number of conditions. First, they must be immediate or indemonstrable, and so must be reached through induction. Second, our confidence in them must be unsurpassed: "If we are to have scientific knowledge through demonstration, . . . we must know the starting-points [= definitions of essences] better and be better persuaded of them than of what is being shown but we must also not find anything more persuasive or better known among things opposed to the starting-points, from which a contrary mistaken conclusion may be deduced, since someone who has unconditional scientific knowledge must be incapable of being persuaded out of it" (*APo.* I 2 72^a37–$^b4$). Finally, they must be necessary (and so, of course, true) in a special sense: the predicates in them must belong to the subjects in every case, intrinsically, and universally (*APo.* I 4 73^a24–27). (6a) *In every case:* A predicate A belongs to every subject B if and only if there is no B to which it fails to belong and no time at which it fails to belong to a B: "for example, if animal belongs to every man, then if it is true to say that this thing is a man, it is also true to say that it is an animal, and if the former is the case now, the latter is also the case now" (73^a29–31). (6b) *Intrinsically:* A predicate A belongs intrinsically to a subject B just in case it is related to B in one of four ways: (i) A is in the account or definition of what B is, or of B's substance, or essence (73^a34–37); (ii) B is a complex subject φB_1, where φ is an intrinsic prim of B_1—for example, odd number or male or female animal (*Met.* XIII 3 1078^a5–11)—and *A* is in the definition of φB_1's essence; (iii) A just is B's essence; (iv) A is not a part of B's essence or identical to it but stems causally from it, so that being B is an intrinsic cause of being A (73^a34–$^b24$). (6c) *Universally:* A predicate A belongs to a subject

B universally just in case "it belongs to it in every case and intrinsically, that is, insofar as it is itself" (73^b26–27).

(7) Because intrinsic predicates stem in various ways from essences, the subjects to which they belong must have essences. In other words, they must be *intrinsic beings*, since—stemming as they do from essences—intrinsic predicates identify them or make them clear: "The things said to be intrinsically are the very ones signified by the figures of predication" (*Met.* V 7 1017^a22–23). These figures of predication are the so-called *categories*: "Anything that is predicated (*katêgoroumenon*) of something must either be . . . a definition . . . if it signifies the essence . . . or, if it does not, a special attribute (*idion*) [see I 7 189^b32n] . . . or one of the things in the definition, or not; and if it is one of the things in the definition, it must signify the genus or the differentiae, since the definition is composed of genus and differentia. If, however, it is not one of the things in the definition, it is clear that it must be a coincident; for a coincident was said to be that which belongs to a thing but that is neither a definition nor a genus nor a special attribute. Next we must distinguish the kinds (*genos*) of predication in which one will find the four mentioned above. These are ten in number: what it is, quantity, quality, relation, when, where, position, having, doing, and being affected. For the coincidents, the genus, the special attributes, and the definition will always be in one of these kinds of predication [or *categories*]" (*Top.* I 8–9 103^b7–25). For each of the intrinsic beings in these ten *categories* we can state what it is (*Met.* VII 4 1030^a17–24), even if strictly speaking only substances have definitions and essences (5 1031^a7–24). Specifying these beings is one of the tasks of *Categories*, where Aristotle explains how beings in categories other than that of substance are ontologically dependent on those in the category of substance. The list of categories itself, however, has a somewhat provisional status, as Aristotle's remark about the category of *having* indicates: "Some further ways of having might perhaps come to light, but we have made a pretty complete enumeration of those commonly spoken of" (*Cat.* 15 15^b30–32).

(8) What all four types of intrinsic beings have in common, what makes them worth the attention of someone inquiring into starting-points and causes, is that they are the ontological correlates or truth-makers for scientific theorems—the beings responsible for the necessary truth of those theorems. Moreover, they would seem to be the only sorts of being that can play this role, since they constitute an exhaustive catalogue of the necessary relations that can hold between a subject (A) and something (B) predicated of it: B is part of the essence of A; A is part of the essence of B; B is the essence of A; the essence of A (being A) is an intrinsic cause of (being) B.

Methodical inquiries (*methodous*): A *methodos* is a *tropos tês zêteseôs*—a way of inquiry (*APo.* I 31 46^a32^b36). *Hodos* means "route" or "road," as at *Ph.* I 1 184^a16.

Nature (*phusis*): (1) In the "primary and full way" a being that is or does something by nature has a nature—an internal starting-point of movement and rest (II 1 192^b8–15). The world of nature, investigated by natural science, is a world of such beings, all of which have perceptible matter as a constituent (*Met.* VI 1 1025^b30–1026^a6). This world is roughly speaking the sublunary one. Beyond it lies the world of the heavens studied by astronomy and theology (1026^a7–22), where beings either have no matter, or matter of a different sort (VII 2 1028^{b}15, 10 1036^{a}9–12). Although, strictly speaking, these beings do not have natures, Aristotle nonetheless speaks of them as if they do (1026^{a}20, 25 are nice, because particularly unfortunate, examples). We use the term "nature" in a similar way when we speak of the nature of the numbers or the nature of fictional entities, not meaning to imply at all that these things are parts of the natural world (compare XIII 4 1078^{a}10).

(2) Sometimes, instead of using *phusis* to refer to the or a *phusis of* X, Aristotle uses the term and its plural *phuseis* to mean something we translate as "a nature" (Greek has no indefinite article) or "natures." The thing or things referred to may or may not have natures in the strict sense; they are pretty much just entities of some sort (III 3 203^{a}17 is an example).

(3) Aristotle also speaks of *phusis* or *hê phusis* in agentive terms—for example, when he says, as he frequently does, that nature does nothing pointlessly (for example, *DA* II 5 415^{b}16–17, III 9 432^{b}21, 12 434^{a}31, *PA* I 1 641^{b}12–29). It is not entirely clear how exactly or how literally these words are to be taken, or whether nature in this sense is over and above the natures in (1).

Starting-points (*archai*): An *archê* ("starting-point," "first principle") is here a primary cause: "This is what it is for something to be a starting-point, that it is itself the cause of many things, with nothing above it being a cause of it" (*GA* V 7 788^{a}14–16; compare *Met.* XIV 1 1087^{a}31–36).

Causes (*ta aitia*): The difference between *aition* (neuter), used here in the plural, and *aitia* (feminine), which is also often used, is that an *aitia* is an explanatory argument (a type of deduction) that identifies causes, whereas an *aition* is an item in the world that is causally efficacious. Aristotle does not systematically observe the distinction, but it is *aitia* that figures in his definitions of craft knowledge and scientific knowledge (*APo.* I 2 71^{b}9–12, II 11 94^{a}20–27). Both *aition* and *aitia* are translated as "cause."

Elements (*stoicheia*): A *stoicheion* was originally one of a row (*stoichos*) of things and later a letter of the alphabet or an element of any complex whole (Plato, *Tht.* 201e). Aristotle uses it in these ways, and to refer to the five primary elemental bodies (earth, water, air, fire, and ether), from which all others are composed: "Let an element of bodies be (1) that into which other bodies are divisible, (2) present (*enuparchon*) in them potentially or actually (which of the two is a matter of dispute), and (3) something that is itself indivisible into things of another kind (*eidos*). Something like this is what everybody in any context means by 'element'" (*Cael.* III 3 302^{a}15–19).

Note 2

More perspicuous (*saphesterôn*): *Saphêneia* is associated with explanation, which is ultimately from starting-points: "Beginning with things that are truly stated but not perspicuously, we proceed to make them perspicuous as well. . . . That is why even politicians should not regard as peripheral to their work the sort of theoretical knowledge that makes evident (*phaneron*) not only the fact that but also the explanation why" (*EE* I 6 1216^{b}32–39).

And the natural route is from things that are knowable and more perspicuous to us to things that are more perspicuous and more knowable by nature, since the same things are not knowable to us as are knowable unconditionally: "The fact that the definition has not been stated through more knowable things may be taken in two ways. For either it is composed of things that are unconditionally less knowable or less knowable to us. For both ways are possible. Unconditionally, what is prior is more knowable than what is posterior—for example, a point than a line, a line than a plane, and a plane than a solid, just as a unit is more so than a number, since it is prior to and a starting-point of all number. Similarly, a letter is more so than a syllable. To us, on the other hand, it sometimes happens that the reverse is the case. For the solid falls most under perception, the plane more than the line, line more than point. For ordinary people know things of the former sort earlier. For to learn them is a task for random thought, whereas to learn the others is a task for exact and extraordinary thought. Unconditionally, then, it is better to try to make what is posterior known through what is prior. For proceeding in this way is more scientific" (*Top.* VI 4 $141^{b}3$–14); "It advances the work to proceed toward what is more knowable. For learning comes about for all in this way—through things by nature less knowable toward ones that are more knowable. And just as with things in the sphere of action the work is to begin from things that are good for each particular person and make things that are wholly good good for each particular person, so too the work here is to begin from things more knowable to oneself and make the ones that are by nature knowable knowable to oneself. But the things that are knowable and primary for particular groups of people are often only slightly knowable and have little or nothing of the being in them. Nonetheless, beginning from things that are poorly known but known to ourselves, we must try to know the ones that are wholly knowable, proceeding, as has just been said, through the former" (*Met.* VII 3 $1029^{b}3$–12; also *APo.* II 2 10 $93^{b}37$–$94^{a}14$, *NE* I 4 $1095^{b}2$–4, *EE* I 6 $1216^{b}32$–39). And it is these primary causes and starting-points which, though hard for us to reach, are the most scientifically knowable by nature: "what is most scientifically knowable of all are the primary things and causes, since it is through these and proceeding from these that we know the other things, not these because of the ones that fall under them" (*Met.* I 2 $982^{b}1$–4).

Note 3

We must proceed from the universals (*tôn kath' holou*) **to the particulars** (*ta kath' hekasta*): The usual contrast is between particulars, as things that are severally one in number and jointly many (*Met.* III 4 $999^{b}34$–$1000^{a}1$), with universals, which belong to many numerically distinct particulars (VII 13 $1038^{b}11$–12), and the usual route is the inductive one from particulars to universals. But sometimes, as here, what is *kath' hekaston* is what is less universal than something else. Thus while genuine particulars are indefinable (15 $1039^{b}27$–29, $1040^{a}27$–$^{b}4$), it is "easier to define *to kath' hekaston* than the universal" (*APo.* II 13 $97^{b}28$), and a definition of a universal divides into *kath' hekasta* (*Ph.* I 1 $184^{a}23$), where these are things that are particular in the sense of being "indivisible in species" (*PA* I 4 644^{a}30–31).

Note 4

A name like "circle" signifies a sort of whole in an undivided way, whereas the definition divides it into its particular [elements]: "Using the account instead of the name—for example, not 'circle' but 'a plane figure that extends equally from the center'" (*Rh.* III 6 1407^{b}26–27).

Note 5

And children at first suppose all men to be their fathers and all women their mothers: Reading ὑπολαμβάνει with P for OCT προσαγορεύει "children at first call all men. . . ."

The things that are in the first instance clear and perspicuous to us are rather confused . . . later coming to divide up each of them: See I 2 185^{a}14n on induction.

Note 6

Immovable (*akinêton*): Verbals ending in *-ton*—of which *akinêton* is an example—sometimes have (1) the meaning of a perfect passive participle ("unmoved") and sometimes (2) express possibility ("immovable"). Although it is clear that the primary mover discussed in VIII 10 is not just unmoved but immovable, it (he) is traditionally referred to as "the unmoved mover." But this is a tradition I have not followed.

Parmenides (of Elea): See DK 28 = TEGP pp. 203–244.

Melissus (of Samos): See DK 30 = TEGP pp. 462–485.

The physicists (*hoi phusikoi*): Aristotle uses the term *phusikoi* for the most part to refer to the Ionian philosophers (Thales, Anaximander, Anaximenes, Heraclitus), Empedocles, and the Atomists (Democritus, Leucippus), who supposed the starting-point to be something material, in contradistinction to the Eleatics (Parmenides, Melissus) and Pythagoreans. See I 3 186^{a}20, 4 187^{a}12, 28, III 5 205^{a}5, *Met.* XIII 4 1078^{b}19).

Some state air to be the primary starting-point: "Anaximenes and Diogenes posit air as prior to water and as more than anything else the starting-point of the simple bodies" (*Met.* I 3 984^{a}5–7). On Anaximenes (of Miletus), see DK 13 = TEGP pp. 72–94, and on Diogenes (of Apollonia), DK 64 = TEGP pp. 434–461.

Others water: "Thales, the one who started this sort of philosophy, says it [the starting-point] is water (because of this, he also declared that the earth rests on water), perhaps reaching this supposition from seeing that the nourishment for all things is moist, that the hot itself comes to be from this, and what is alive lives by this (and what they come to be from is starting-point for all). Because of this, then, he reached this supposition, and because the seeds of all things have a moist nature, and water is the starting-point of the nature of moist things" (*Met.* I 3 983^{b}18–27). On Thales (of Miletus), see DK 11 = TEGP pp. 17–44. The view is also attributed to Hippo (*Met.* I 3 984^{a}3), an eclectic philosopher of the time of Pericles (c. 495–428 BC).

Note 7

If limited, but more than one, then either two: Theophr. *Met.* 6^{b}25–26 mentions thinkers (later Pythagoreans?) "who make fire and earth the ruling starting-points." See also Plato, *Ti.* 31b.

Three: The specific reference, if any, is unclear.

Four: "Empedocles, however, posits four things, positing earth along with those already mentioned [namely, air, water, and fire] as a fourth" (*Met.* I 3 984^{a}8–9).

Either they are, as Democritus held, one in genus (*genos*) **but differing in shape** (*schêmati*) **or in species** (*eidei*)**, or they are also contraries:** Reading ἢ οὕτως ὥσπερ Δημόκριτος, τὸ γένος ἕν σχήματι δὲ ἢ εἴδει διαφερούσας, ἢ καὶ ἐναντίας with P for OCT ἢ οὕτως ὥσπερ Δημόκριτος, τὸ γένος ἕν, σχήματι δὲ <διαφερούσας>, ἢ εἴδει διαφερούσας ἢ καὶ ἐναντίας. *Schêma* does duty here for the three differentiae of the atoms that, together with the void, are Democritus' starting-points: "Leucippus, however, and his associate Democritus say that plenum and void are the elements, calling the one 'being,' and the other 'not being,' and, of these, plenum or solid is being, while void is not being (that is why they also say that being no more *is* than not being, because body no more *is* than void), and that these, as matter, are the causes of beings. And just as those who make the underlying substance one generate the other things by means of its attributes, positing the rare and the dense as starting-points of these attributes, in the same way, these people too say that the differentiae are the causes of the other things. And these differentiae, they say, are three—shape, order, and position. For they say that being is differentiated by 'rhythm,' 'contact,' and 'turning' alone. And of these rhythm is shape (*schêma*), contact is order, and turning is position" (*Met.* I 4 985^{b}4–17). The beings that constitute a plenum are the atoms. On Leucippus and Democritus, see DK 67–68 = TEGP pp. 516–685.

Genus, species (*genos*, *eidos*): The various ways in which the noun *genos* is used are discussed in *Met.* V 28. Aristotle uses it in a technical sense to refer to a genus, which is studied by a single science, as he uses *eidos* to refer to the species of a genus, to form (as opposed to matter), and to a separate Platonic Form. But he also uses both terms in a more general sense to mean "kind." Transliterations are added for precision when needed.

Or they are also contraries: The reference here is to Anaxagoras of Clazomenae, on whom see DK 59 = TEGP pp. 271–325: "Anaxagoras of Clazomenae . . . says that the starting-points are unlimited. For he says that pretty much all the homoeomerous things (like water and fire) come to be and are destroyed in this way, namely, through aggregation and disaggregation alone. Otherwise, they neither come to be nor are destroyed but persist and are eternal" (*Met.* I 3 984^{a}11–16). Water (as cold and wet) and fire (as hot and dry) are contraries (*GC* II 3 330^{a}30–^{b}7).

Contraries (*enantias*): "Said to be contraries are: Those things differing in genus that cannot belong to the same thing at the same time. The most different of the things in the same genus. The most different of the things in the same recipient. The most different of the things falling under the same capacity. The things whose difference is greatest either unconditionally or in genus or in species" (*Met.* V 10 1018^{a}25–31; also X 4 1055^{b}13–17).

Note 8

Beings (*ta onta*): We think of the word "being" (*to on*) as having four different senses or meanings: (1) Existential "is"—where to say that something "is" means that it "exists." This is the sense captured by the existential quantifier. (2) "Is" of identity—where to say that A "is" B means that A "is identical to" B, or A "is one and the same thing as" B. (3) "Is" of predication—where to say that A "is" B means that "B belongs to A." (4) Veridical "is"—where to say that something "is" means that it "is the case" or "is true." In his account of being in *Met.* V 7, Aristotle mentions a sort of being that corresponds to (2) and to (4), and in V 9 and X 3 1054^{a}32–^{b}3 he has much to say about identity and sameness, including that "everything that is a being is either distinct or the same" (1054^{b}25). (1), however, is absent from his discussion, although (potential and actual being) surely bears on it, and it does seem to play some role in explaining what the separability distinctive of substance consists in (*Ph.* I 2 185^{a}31n, *Met.* V 11 1019^{a}1–4). One reason for this is that a demonstrative science posits the existence of the genus it investigates, and proceeds to investigate it (*Met.* XI 7 1064^{a}2–4, *APo.* I 10 76^{b}11–22), so that existence itself escapes the focus of the science—even of the science of being qua being. (This does not mean, however, that there may not be puzzles to solve before the existence of the posited genus can be taken as established—*Met.* VI 1 1026^{a}23–32 is a case in point.) A second reason, though, is that until the discovery of quantifiers it was difficult to say very much about existence as such. Here *ta onta* are the beings in the sense of "the things that are"—the things that exist.

Note 9

The primary things (*prôtôn*): *Ta prôta* in the wholly unconditional sense are, for Aristotle himself, the primary substances (*Met.* XI 1 1059^{a}33–34).

Note 10

A geometer has no further argument against someone who does away with the starting-points of geometry: See VIII 3 253^{b}2–4.

This being a matter for another science: In general a science does not prove or demonstrate its own starting-points, that is, the real definitions of the essences—or what-it-ises—of the beings in the genus with which it deals: "There are starting-points and elements and causes of the objects of mathematics, and in general every science that proceeds by thinking or that has some share in thinking is concerned with causes and starting-points, whether more exactly or more simply considered. All these sciences, however, mark off a certain being, a certain genus . . . [but do not] produce any account of the what-it-is. Instead, starting from the what-it-is—some making it clear by means of the perceptual capacities, some getting hold of it as a hypothesis—they in this way proceed to demonstrate the things that belong intrinsically to the genus with which they are concerned, either in a more necessary or in a weaker way. Which is why it is evident from such an induction that there is no demonstration of substance nor of the what-it-is, but some other way of making it clear" (*Met.* VI 1 1025^{b}4–16). However, if a science S_2 is subordinate to a science S_1, as optics is to geometry, then S_1 can demonstrate the starting-points of S_2: "The why (*to dioti*) differs from the that (*to hoti*) in another way, when each is theoretically grasped (*theôrein*) by means of a different science. These are sciences that are related to one another in such way that the one is under the other, as, for example, optics is under geometry, mechanics under solid geometry, harmonics under arithmetic, and stargazing under astronomy. . . . For here it is for the scientists who deal with perceptibles to know the that and for the mathematical scientists to know the why. For the latter possess demonstrations that give the explanations" (*APo.* I 13 78^{b}34–79^{a}4).

Or one [science] common to all (*koinês*): The science in question could be (1) dialectic, since it has a "route" to scientific starting-points: "Dialectic is useful as regards the philosophical sciences because the capacity to go through the puzzles on both sides of a question will make it easier to discern what is true and what is false in each. Furthermore, dialectic is useful as regards the first starting-points (*ta prôta*) where each science is concerned. For it is impossible to say anything about these based on the starting-points properly belonging to the science in question, since these starting-points are the first ones of all, and it is through reputable beliefs (*endoxa*) about each that it is necessary to discuss them. This, though, is a task special to, or most characteristic of, dialectic. For because of its ability to examine (*exetastikê*), it has a route toward the starting-points of all methods of inquiry" (*Top.* I 2 101^{a}34–^{b}4). Also in favor of (1) is the phrase "against someone who does away with the starting-points of geometry (*pros ton anelonta tas archas*)" (*Ph.* I 2 185^{a}1–2), since scientific demonstrations are not directed against anyone, although demonstrations by refutation are: "There is, however, a demonstration by refutation (*elegktikôs*) even that this view [PNC is false] is impossible, if only the disputant says something. But if he says nothing, it is ridiculous to look for an argument against (*pros*) someone who has an argument for nothing, insofar as he has none. For such a person, insofar as he is such, is like a vegetable. And by 'demonstrating by refutation' I mean something different from demonstrating, because in demonstrating we might seem to be assuming the starting-point at issue [= PNC], but if the other person is responsible for an assumption of this sort, it would be refutation not demonstration" (*Met.* IV 4 1006^{a}11–18). Alternatively, the relevant science could be (2) the science of being qua being, which is common to all beings as such in the way that universal mathematics is common to mathematical objects (VI 1 1026^{a}23–32, Introduction, pp. xxv–xxvii). Against (1), and so in favor of (2), is the fact that (2a) dialectic is not usually classed as a science: "to the extent that someone tries to set out dialectic and rhetoric not as capacities (*dunameis*) but as sciences, he unwittingly obscures their nature by the change, setting them down as sciences dealing with specific subject matters, rather than with arguments alone" (*Rh.* I 4 1359^{b}9–16). Another possibility, and one with manifest attractions, given what Aristotle goes on to say in the next sentence (185^{a}5–12), is to take the feminine adjective *koinê* not as qualifying *epistêmê* (feminine) but as qualifying an understood *methodos* (also feminine). This would make (1) the more attractive option.

Note 11

To investigate, then, whether being is one in this way is like dialectically discussing (*dialegesthai*) **any other thesis** (*thesin*) **that is stated for the sake of**

argument (*logou heneka*): (1) A *thesis* is "a supposition of some eminent philosopher that is *paradoxos*" (*Top.* I 11 104^{b}19–20). (2) What is *paradoxos* is not what is paradoxical in our sense of the term but what is contrary to or goes against (*para*) reputable beliefs (*endoxa*). (3) It is typically sophists who try to "refute in a way that is contradoxical," with the result that the conclusion of their argument, because it is "contrary to the beliefs of ordinary people" (10 104^{a}11–12), constitutes a puzzle (*aporia*) (*NE* VII 2 1146^{a}21–24). (4) Those who state a thesis (for example, that PNC is false) "for the sake of argument (*logou charin*) must be cured by refutation of the argument as expressed in their speech and their words" (*Met.* IV 5 1009^{a}20–22). (5) One use of the verb *dialegesthai* is to refer to specifically dialectical discussion. (1)–(5), especially when taken with the examples Aristotle gives, make it reasonably certain that both in this paragraph and in the preceding one he has a dialectical discussion of scientific starting-points in view.

Like that of Heraclitus: The relevant thesis of Heraclitus is presumably his supposed denial of PNC (*Met.* IV 3 1005^{b}23–25). See DK B10, 60, 61, 67, 88, 111 = TEGP 69 F40, 61 F38, 148 F103, 84 F54, 80 F50. The idea is that, because "all perceptibles are always flowing" (a view Aristotle attributes to Heraclitus at *Met.* I 6 987^{a}33–34), they are all both F and not-F, and not stably or exclusively one or the other.

Or—if anyone were to state it—that being is one human being: A solipsist might hold a view like this.

Like refuting (*luein*) **a contentious argument** (*logon eristikon*): "Some people, however, have come to this belief [that PNC is false] as they have to other *paradoxos* ones, namely, when they are unable to refute (*luein*) contentious arguments, they give in to the argument and accept that the conclusion is true" (*Met.* IV 7 1012^{a}17–20); "Contentious (*eristikos*) arguments are those that deduce or appear to deduce from what appear to be reputable beliefs but are not really such" (*SE* 2 165^{b}7–8); "Sophistic . . . is a way of making money from apparent wisdom. . . . Contentious arguers (*eristikoi*) and sophists use the same arguments, but not to achieve the same goal. . . . If the goal is apparent victory, the argument is contentious; if it is apparent wisdom, it is sophistic" (*SE* 11 171^{b}27–29).

Refuting (*luein*): To *luein* an argument is to untie (also, *luein*) the knot or puzzle (*aporia*) that it produces when it conflicts with another argument: "For those who wish to be puzzle-free it advances the work to go through the puzzles well. For the subsequent puzzle-free condition is reached by untying the knots (*luein*) produced by the puzzles raised in advance, and it is not possible to untie a knot you are unaware of. But a puzzle in thought makes clear the existence of a knot in the thing at issue" (*Met.* III 1 995^{a}27–31). *Luein* sometimes differs from *elegchein* (also "refute") by involving a diagnosis of what is wrong with the target argument: "The person, then, who does away with the thing through which the falsehood comes about has entirely resolved the argument, but it is the person who knows that the argument proceeds through it who knows the resolution" (*Top.* VIII 10 160^{b}33–35). But in the *Rhetoric* this is not so: "It is possible to refute (*luein*) either by stating a counter-deduction or by bringing an objection" (II 25 1402^{a}31–32). Indeed, the two seem to be used more-or-less interchangeably (for example,

elegktikous at II 22 1397^{a}1, *luseôn* at ^{a}5). In the *Physics*, however, "resolve" is usually the better choice.
Melissus [of Samos]: See DK 30 = TEGP pp. 462–485. His argument is discussed in I 3.
Parmenides (of Elea): See DK 28 = TEGP pp. 203–244.

Note 12
Or rather, the argument of Melissus is crude and involves no puzzle: In contrast with that of Parmenides. For Melissus is "a little boorish," whereas Parmenides "seems perhaps to speak with more insight" (*Met.* I 5 986^{b}26–28).
Puzzle (*aporian*): "A dialectical problem is a speculation, directed either to choice and avoidance or to truth and knowledge (either by itself or when working together with something else of this sort), about which [1] people believe nothing either way, or [2] ordinary people believe in a contrary way to the wise, or [3] the wise to ordinary people, or [4] each of them to themselves. . . . Problems also exist [5] where there are contrary deductions (for there is a puzzle as to whether it is so or not so, because there are persuasive arguments concerning both sides), as well as [6] those we have no arguments about, because they are so large, thinking it difficult to give the why of them (for example, whether the cosmos is eternal or not). For one could also inquire into things of that sort" (*Top.* I 11 104^{b}1–17). Thus a problem is [5] a *puzzle* just in case there are strong arguments on one side of it and strong arguments on the other: "A certain sophistical argument constitutes a puzzle. For because they wish to refute in a way that is *paradoxos* in order to be clever when they engage in ordinary discussions, the resulting deduction turns into a puzzle. For thought is tied up when it does not wish to stand still, because what has been concluded is not pleasing but cannot move forward, because of its inability to refute the argument" (*NE* VII 2 1146^{a}21–27).

Note 13
Which is just what the arguments of Melissus and Parmenides involve. For in fact they assume falsehoods and argue invalidly—or rather, the argument of Melissus is crude and involves no puzzle. Grant him one absurdity and the others follow—nothing difficult in this: This passage is repeated almost word-for-word at I 3 186^{a}6–10, where, with OCT, it is deleted.

Note 14
Induction (*epagôgê*): See Introduction, pp. xxviii–xliv.

Note 15
We should not resolve (*luein*) **every [contentious argument] at hand, but those that involve false demonstration from the starting-points, and not those that do not:** This seems to peg this part of the task undertaken in the *Physics* as an exercise in that sort of dialectic that Aristotle calls *peirastikê*, which is "a type of dialectic which has in view not the person who knows (*eidota*), but the one who pretends to know but does not" (*SE* 11 171^{b}4–6). Hence it is the type particularly useful in arguments with sophists, since they are the archetypal pretenders to

knowledge and wisdom (1 165^{a}21). And what it does is *examine* them—*peirastikos* means "examinational"—to see whether they have the wisdom and knowledge they claim. That is why (honest) peirastic deductions "deduce from premises that are accepted by the answerer, and that must be known by anyone who claims to have the relevant scientific knowledge (*epistêmê*)" (2 165^{b}4–6). Premises of this sort are said to be taken "not from the things from which one knows or even from those proper to the subject in question, but from the consequences that someone can know without knowing the craft in question, but which if he does not know, he is necessarily ignorant of the craft" (11 172^{a}21–34). In other words, they are not starting-points of the answerer's science, but consequences of them. In *Sophistical Refutations peirastikê* refers to honest peirastic (2 165^{b}4–6), which uses true premises and valid deductions, but in *Topics* it refers to the capacity to test, even by using false premises and invalid deductions (for example, VIII 11 161^{a}24–29).

Note 16

It belongs to the geometer to refute a quadrature by means of segments (*tmêmatôn*): The argument of the great mathematician Hippocrates of Chios, who flourished c. 450–430 BC, for squaring the circle by means of segments or lunes (the figure bounded by two arcs of a circle) is a geometrical paralogism or fallacious argument, in Aristotle's view, because it "proceeds from starting-points proper to geometry" and "cannot be adapted to any subject except geometry," but involves an error (*SE* 11 172^{a}3–7). It is described in Heath, pp. 33–36, 183–201.

But not one like Antiphon's: "Antiphon himself also tried to square the circle but he did not adhere to the starting-points of geometry. He tried as follows: 'If,' he says, 'I draw a circle and I inscribe a square inside it. I bisect the segments of the circle cut off by the sides of the square. Then I draw a straight line from the intersection in both directions to the end-points of the segment. Thus I produce the figure of an octagon. If we again bisect the segments enclosing the angles of this figure and again draw a straight line in both directions from the intersection to the end-points of the segments, we produce a polygonal figure. If we repeat this procedure, a figure with very many sides results that has very small angles, so that the straight lines enclosing them will coincide with the circle because of the smallness of the angles. Now given that any rectilinear figure can be squared, if I square this polygon, since it coincides with the circle, I shall have squared the circle too.' So he does away with geometrical starting-points. For it is a starting-point of geometry that a straight line never coincides with a curve, but he allows that, because of its smallness, a certain straight line coincides with a certain curve. . . . So Antiphon, by doing away with geometrical starting-points, namely, that a straight line never coincides with a curve, carried out his proof" (TEGP 22 F13b = Philoponus *Physics* 31.9–32.3). Antiphon's argument is discussed in Heath, pp. 221–223.

Antiphon: A polymath sophist, contemporary with Socrates. See DK 87 = TEGP pp. 789–840.

Note 17

Although they [Melissus and Parmenides] are concerned with nature, but the puzzles they speak about are not natural scientific ones: Reading μὲν, οὔ with P for OCT μὲν οὔ (“although they [Melissus and Parmenides] are not concerned with nature . . .”).

The puzzles they speak about are not natural scientific ones: Because they involve the denial of a starting-point of any natural science, namely, that there are things that are by nature in movement.

The investigation involves philosophy (*echei philosophian*): Aristotle sometimes applies the term *philosophia* (or sometimes just *sophia*) to any science aiming at truth rather than action (*Met.* II 1 993^{b}19–21). In this sense of the term, all the broadly theoretical sciences count as branches of philosophy, and *philosophia* is more or less equivalent in meaning to *epistêmê* in its most exact sense. *Philosophia* also has a narrower sense, however, in which it applies exclusively to sciences providing knowledge of starting-points (XI 1 1059^{a}18, *NE* VI 7 1141^{a}16–18). It is in this sense that there are just “three theoretical philosophies—mathematical, natural, and theological” (*Met.* VI 1 1026^{a}18–19). In addition to these, Aristotle occasionally mentions practical philosophies, such as “the philosophy of human affairs” (*NE* X 9 1181^{b}15). It is among these that his own ethical writings belong (*Pol.* III 12 1282^{b}18–23).

Note 18

The starting-point that is most proper of all [to such an investigation] is to see: Reading ἰδεῖν πῶς with P for OCT πῶς.

Something is said to be in many ways (*to on legetai pollachôs*): Literally, “being is said in many ways.” The claim is primarily an ontological claim about being, however, not a linguistic one about the word “being.” The most pertinent of these many ways, as we see from Aristotle’s example, are those in which things are said to be intrinsically: “The things said to be intrinsically are the very ones signified by the figures of predication. For the ways in which things are said [to be] are the ways in which ‘being’ (*to einai*) signifies. So since of things predicated of a thing some signify what-it-is [= its substance or essence], some a quality [of it], some a quantity, some a relation, some a doing or a being affected, some a where, some a when, ‘being’ (*to einai*) signifies the same thing as each of these. For there is no difference between ‘a human *is* keeping healthy’ and ‘a human keeps healthy,’ nor between ‘a human *is* walking’ or ‘cutting’ and ‘a human walks’ or ‘cuts,’ and similarly in the other cases” (*Met.* V 7 1017^{a}23–30). The figures of predication referred to are the so-called *categories* (*Top.* I 8–9 103^{b}7–25). For each of the intrinsic beings in them we can state its what-it-is (*Met.* VII 4 1030^{a}17–24), even if strictly speaking only substances have definitions and essences (5 1031^{a}7–24). Specifying these beings is one of the tasks of *Categories*, where Aristotle explains how beings in categories other than that of substance are ontologically dependent on those in the category of substance. The list of categories itself, however, has a somewhat provisional status, as Aristotle’s remark about the category of *having* indicates: “Some further ways of having might perhaps come to light, but we have made a pretty complete enumeration of those commonly spoken of" (*Cat.* 15 15^{b}30–32).

Note 19

Substance (*ousian*): *Ousia* is a noun formed from the present participle *ousa* of the verb *einai* ("to be"). "Substance" is the traditional translation. (1) The *substance of* something (the sense relevant here) is its *to ti ên einai* (*Met.* V 8 1017^{b}21–23), a phrase of Aristotle's coinage, meaning literally "the what-it-was-to-be," of which "essence," from the Latin verb *esse* ("to be"), is the standard translation. (2) A substance, on the other hand, is something that has the fundamental sort of being possessed by an ultimate subject of predication, which is not itself ever predicated of anything else (1017^{b}23–26). It is usually but not always clear which of (1) or (2) is intended.

Quantities (*posa*): *Cat.* 6 gives the following account of these: (1) Some quantities are discrete (numbers, spoken words); others continuous (lines, surfaces, bodies, time, place) (4^{b}20–25). (2) Some are composed of parts that have position in relation to one another (the parts of a line or a plane); others are not composed of such parts (the parts of time have an order but not a position, since no two of them can exist simultaneously) (5^{a}15–37). (3) A quantity (for example, four-foot or five-foot) has no contrary (5^{b}11–14). Many and few, large and small, which might seem to be counterexamples, are in fact relatives, since "nothing is called intrinsically large or small but in relation to something else" (5^{b}16–18). (4) Quantities do not admit of more and less: "one thing is not more four-foot than another" (6^{a}19–25). (5) What is most distinctive of quantities is that they are either equal or unequal (6^{a}26–35). *Met.* V 13 gives a somewhat different account: "Something is said to be a quantity when it is divisible into components each of which is naturally a one and a this something" (1020^{a}7–8).

Qualities (*poia*): *Cat.* 8 gives the following account: (1) States (*hexis*), such as the virtues and types of scientific knowledge, which are relatively permanent and difficult to change are qualities, as are dispositions (*diathesis*), such as being hot or ill, which are relatively impermanent and easy to change (8^{b}26–9^{a}13). (2) Anything that we are called in virtue of a natural capacity, such as being a boxer, or incapacity, such as softness rather than hardness, is a quality (9^{a}14–27). (3) Affective qualities and affections, such as sweetness, bitterness, sourness (9^{a}28–10^{a}10). (4) Figure (*schêma*) and the external shape (*morphê*) of a thing (10^{a}11–16). Again, *Met.* V 14 gives a somewhat different account: "What is said in one way to be a quality is a differentia of substance. For example, human is animal qualified in a certain way because two-footed, horse because four-footed" (1020^{a}33–34).

Note 20

Soul (*psuchê*): "The soul is the first actuality (*entelecheia*) of a natural body that has life potentially. And something will be such insofar as it has instrumental parts (*organikon*). . . . If, then, we are to speak of something common to all soul, it will be the first actualization of a natural body that has instrumental parts" (*DA* II 2 412^{a}27–^{b}6).

Note 21

Pale (*leukon*): *Leukos* and its contrary *melas* are used indifferently to capture the following contrasts: white, black; pale, dark; light, dark. Context sometimes makes one more appropriate than another.

Note 22

Separable (*chôriston*) **or beyond substance** (*para tên ousian*): Verbals ending in *-ton*—of which *chôriston* is an example—sometimes have the meaning of a perfect passive participle ("separated") and sometimes express possibility ("separable"). When *chôriston* is applied to substances I have translated it as "separable," since this often seems to better capture its sense, especially that of its negative (see *Met.* VII 1 1028^{a}23–24). For things, such as the form and matter of a matter-form compound, are not just separated, in that they are always found together (11 1036^{b}3–4)—they cannot be separated. Moreover, things that are separable, such as the understanding and the other parts of the soul, do not become actually separated until, for example, death: "this [productive] understanding is separable (*chôristos*), unaffectable, and unmixed, being in substance an activity, [that is,] not sometimes understanding and at other times not. But, when separated (*chôristheis*), this alone is just what it is" (*DA* III 5 430^{a}17–23). Just what the separability of substance amounts to is another matter.

(1) Walking and being healthy are characterized as "incapable of being separated," on the grounds that there is some particular substantial underlying subject of which they are predicated (*Met.* VII 1 1028^{a}20–31). Often, separability is associated with being such a subject: "The underlying subject is prior, which is why the substance is prior" (V 11 1019^{a}5–6); "If we do not posit substances to be separated, and in the way in which particular things are said to be separated, we will do away with the sort of substance we wish to maintain" (XIII 10 1086^{b}16–19). Similarly, not being separable is associated—as it is in our text (185^{a}31–32)—with being predicated of such a subject. Being predicated of a substance—being an attribute—seems, then, to be a sufficient condition of not being separable. Moreover, not being separable seems itself to be a sufficient condition of being ontologically dependent: (1a) "All the other things are either said of the primary substances as subjects or in them as subjects. So if the primary substances were not, it would be impossible for any of the other things to be" (*Cat.* 5 2^{b}3–6).

(2) Couched in terms of priority, what is attributed to primary substances in (1a) is *substantial* priority, or priority in nature, which Aristotle defines in two ways: (2a) "Things are said to be prior in nature and substance, when it is possible for them to be (*einai*) without other things, but not the others without them" (*Met.* V 11 1019^{a}3–4); (2b) "Those things are prior in substance [to others] which, when separated, surpass [them] in being (*tô[i] einai huperballei*)" (XIII 2 1077^{b}2–3). Moreover, in a text apparently expressing an idea similar to (2b), the form of a matter-form compound is said to be "prior to the matter and more (*mallon*) of a being" (VII 3 1029^{a}5–6). Since existence, like identity, does not come in degrees, the use of the verb *huperballein* and the adverb *mallon* makes it difficult to understand *einai* ("being," "to be") as having an exclusively existential

sense (*Ph.* I 2 185^{a}22n). At the same time, *einai* does seem to have some existential import, as it surely does in (2c): "if everyone were well, health would be (*estai* = exist) but not sickness, and if everything were white, whiteness would be (*estai*) but not blackness" (*Cat.* 11 14^{a}7–10). It seems reasonable, therefore, to think that to be is to be a being of some sort, and that to be a being entails existing. To be a being, however, is to be either a coincidental being (the pale human) or an intrinsic being, something with an essence (the human). To be an intrinsic being, in turn, is to be either an intrinsic coincident (185^{b}1n), a matter-form compound, or simply a substantial form (*Met.* VI 1 1025^{b}28–1026^{a}15). As identical to its tightly unified essence (VII 12 1037^{b}10–27), a substantial form is an intrinsic being of the highest order—a primary substance (11 1037^{a}33–^{b}4). A matter-form compound, by contrast, since it is never identical to its essence (1037^{b}4–7), is an intrinsic being of a lower order (XII 7 1072^{a}30–32), since it is always a complex thing—a this in this (VII 5 1030^{b}18)—whose essence is complex in a structurally parallel way (10 1035^{b}27–30). Similarly, an intrinsically coincidental being, while it follows from an essence, is still a complex of two intrinsic beings, one a substance with an essence, the other an attribute. For X to be more of a being than Y, or to exceed Y in being, we might reasonably conclude is for it to be closer to a substantial form on this scale. It is, as we might put it, for X to be more intrinsic a being than Y. Degrees of being are degrees of intrinsicality, then, not degrees of existence.

(3) Attributes depend for their existence on substance, but not on that of some particular substance, any substance that has them will do: white exists if something is white, but the something does not have to be Bucephalus. Hence the parallel claim about substances should not be that a substance can exist without any attributes, suggesting that substances are bare particulars, but that substances in general can exist whether or not attributes do. On an *ante rem* (or Platonist) theory attributes can exist uninstantiated by particulars. On an *in re* theory, like Aristotle's, they cannot. That is the message of (2c). Hence the ontological dependence of attributes—and the cognate ontological independence of substances—must be formulated differently by these theories. It seems, then, that if *in re* attributes were ontologically independent of substances, it could only be because *they were instantiated by something else*, since they cannot exist uninstantiated by particulars of some sort. This is the way we see Aristotle thinking in the following text: "Heat and straightness [and whiteness] can be present in every part of a thing, but it is impossible for all of it to be hot, white, or straight [and nothing else]. For then the attributes would be separated" (*Long.* 3 465^{b}12–14). Whiteness would be separate from substance, notice, not if it existed entirely uninstantiated, but if it were instantiated by a being that was wholly and exclusively white. Such a being is obviously not an Aristotelian substance, but something more like the Platonic Form of whiteness, which does seem to be white and nothing else (Plato, *Phd.* 78d5–7). Aristotelian substances can exist, then, whether or not their attributes exist by being instantiated by something else. Attributes, on the other hand, cannot exist unless they are instantiated by Aristotelian substances, since such substances are (in Aristotle's view) the only ultimate subjects of predication. The separability of

substance from attributes, on this way of looking at it, is entirely of a piece with their inseparability from it.

(4) The verb *chôrizein* derives from *chôra* ("place"), and means "to separate, part, sever, or divide" things by causing them (roughly speaking) to be in separate (or disjoint) places (*Met.* III 2 998^{a}17–19, XI 12 1068^{b}26–27). Thus when Aristotle describes Plato as separating the Forms from perceptible particulars (XIII 4 1078^{b}30–34), the primary connotation is that of putting them in separate places: perceptible particulars are "here (*entautha*)," Forms are "over there (*kakei*)" (I 9 990^{b}34–991^{a}1). For a Form is "a particular, they say, and separable" (VII 15 1040^{a}8–9) and "place is special to particular things, which is why they are separable by place" (XIV 5 1092^{a}18–19). Moreover, the fundamental objection Aristotle makes to such separable Forms is that they are an incoherent mixture of universals and of the particulars needed for their instantiation and existence: "They say that there is man-itself and horse-itself and health-itself, and nothing else—like those who introduce gods, but say that they are human in form. For those people were making the gods nothing but eternal human beings, and these are making the Forms nothing but eternal perceptibles" (III 2 997^{b}9–12); "They at the same time make the Ideas universal and contrariwise treat them as separable and as particulars . . . that this is not possible is a puzzle that has been gone through before" (XIII 9 1086^{a}32–35; III 6 1003^{a}5–17). We might expect, therefore, as (4) implies, that the separability Aristotle accords to his own substances, but denies to attributes, would be the separability he denies to Platonic Forms: attributes are in substances around here not in substances (= Forms) that are elsewhere.

(5) Though separability is often characterized in terms of existential independence, in some cases this seems not to be required: "Of things that reciprocate as to implication of being (*einai*), that which is in some way the cause of the other's being might perfectly sensibly be called prior in nature. And that there are some such cases is clear. For there being a human reciprocates as to implication of being with the true statement about it: if there is a human, the statement whereby we say that there is a human is true, and reciprocally—since if the statement whereby we say there is a human is true, there is a human. And whereas the true statement is in no way the cause of the thing's being, the thing does seem in some way to be the cause of the statement's being true. For it is because of the thing's being or not being that the statement is called true or false" (*Cat.* 12 14^{b}11–22). What lies at the bottom of separability, then, seems rather to be a sort of ontological independence that is causal or explanatory in nature. In any case, this is clearly what we find in the following texts: "This [vegetative soul] can be separated from the others, but the others cannot be separated from it, in the case of the mortal ones. This is evident in the case of plants, since they have no other capacity of soul" (*DA* II 2 413^{a}31–^{b}1; also I 1 403^{a}10–16, ^{b}17–19); "Bodily parts . . . cannot even exist when they are separated. For it is not a finger in any and every state that is the finger of an animal, rather, a dead finger is only homonymously a finger" (*Met.* VII 10 1035^{b}23–25). For what makes perceptual soul inseparable from nutritive soul, or a finger inseparable from an animal, are the causal relations that make the former dependent on the latter. Again, this makes the separability accorded to substances,

but denied to attributes, the same as the separability denied to Platonic Forms. For the latter too were intended to play an explanatory role: "the Forms are the causes of the what-it-is of other things, as *the one* is of the Forms" (I 6 988^{a}10–11). Thus what all the gods love does not pick out the Form of piety, even though something is pious if and only if all the gods love it, because being loved by the gods is not what makes something pious (Plato, *Euthphr.* 10d9–e8).

(6) The separability of substance and the inseparability of attributes, while obviously essential to the account of both, is a special case of a more general phenomenon. For substance as form is not just separable from attributes but from matter as well. But if this is the sort of separability characterized in (1)–(6), it must be antisymmetrical, so that form can exist apart from matter but not matter apart from form. In the case of the forms of matter-form compounds, whether their matter is perceptible or intelligible, this is clearly not the case: like snub, but unlike concavity, they cannot exist apart from matter (*Met.* VI 1 1025^{b}28–1026^{a}15). But in the case of other forms, those that are like concavity, it is possible (1026^{a}15–16, XII 6 1071^{b}20). These are the primary intelligible substances, on which all others—including matter-form compounds—causally depend for their existence (IX 8 1050^{b}19) and order (XI 2 1060^{a}26–27). Matter, by contrast, cannot exist apart from form of some sort (XIV 2 1089^{b}27–28), since without form it is not intrinsically anything at all (VII 3 1029^{a}20–21).

(7) In (1) separability is tied to being a particular subject of predication, and so seems to be somehow logical or logico-linguistic in nature. (6), on the other hand, seems to tell a different sort of story, in which separability has more to do with causation and explanation than with logic. To bring the two together we need only reflect that Aristotle's logic is primarily a logic of science, and that whenever we have a subject-predicate proposition there is always a question as to why the predicate holds of the subject. The target of scientific explanation, indeed, is always just that: why does predicate P hold of subject S (*Met.* VII 17 1041^{a}10–11)? If P holds of S coincidentally, or by luck or chance, science has nothing to say about it (VI 2 1026^{b}3–5). There is no explanation. But if P is an intrinsic coincident of S, or if P is part of S's essence, or is S's essence, science does have something to say about it (*Ph.* I 1 184^{a}10n(6–8)). What this implies is that the primary explanatory entities cannot themselves have a subject-predicate structure (*Met.* IX 10 1051^{a}34–^{b}5). They cannot be expressed as one thing said of another—they are not thises-in-thises. Instead, in comparison to things with such a structure, they are simple—forms, not matter-form compounds. The problem is—and it is one of the deepest—is how separable forms, which, like all forms, are universals (VII 11 1036^{a}28–29), can indeed be primary subjects and this somethings—separable "in the way in which *particular things* are said to be separated." For Aristotle's answer, see XIII 10 1087^{a}10–25.

All of them are said of an underlying subject—the substance: Reading τῆς οὐσίας λέγεται with P for OCT λέγεται τῆς οὐσίας.

Note 23

Melissus says that being is unlimited: See DK B2 = TEGP 10 F2.

Note 24

Except coincidentally (*kata sumbebêkos*): A standard Aristotelian contrast is between what has an attribute B coincidentally or contingently (*kata sumbebêkos* or *per accidens* in Latin) and what has B intrinsically or non-contingently (*kath' hauto* or *per se*) (*Met.* V 18 1022^{a}24–36). The coincidental attributes of a thing hold of it by chance or luck and are of no scientific interest (VI 2 1026^{b}3–14), unless they happen to be among *ta kath hauta sumbebêkota*—the intrinsic coincidents or *per se* accidents—which are demonstrable from the definitions of the essences of the substances whose attributes they are (*APo.* I 7 75^{b}1, 22 83^{b}19, *Met.* V 30 1025^{a}30–32, XIII 3 1078^{a}5–9). See I 3 186^{b}18–23, I 1 184^{a}10n(7).

Note 25

Account (*logos*): A *logos* in ordinary Greek is a word or organized string of words constituting an account, argument, explanation, definition, principle, argument, reason, or piece of reasoning, discussion, conversation, or speech; what such words or their utterances mean, express, or refer to, such as the ratio between quantities (*NE* V 3 1131^{a}31–32); the capacity that enables someone to argue, give reasons, and so on (*Pol.* VII 13 1332^{b}5). Aristotle also uses the word in a more technical sense: "A *logos* is a significant voiced sound some part of which is significant when separated—as an annunciation (*phasis*), not as an affirmation (*kataphasis*). I mean, for example, that human signifies something, but not that the thing is or is not (though it will be an affirmation or denial if something is added); the single syllables of human, by contrast, signify nothing" (*Int.* 4 16^{b}26–31). Here, however, a *logos* is a definition—a *horismos.*

Of the unlimited makes use of quantity: "The unlimited is either what cannot be traversed because it is by its nature not to be traversed . . . , or what admits only of incomplete traverse, or scarcely admits of it, or what—though by its nature it admits of traverse or limit—is not traversed or limited. . . . On the other hand, a separable thing is something the unlimited certainly cannot be. For if it is neither a *magnitude* nor a *plurality*, but the unlimited itself is substance and not a coincident, it will be indivisible, since the divisible is either magnitude or plurality. But if it is indivisible, it is not unlimited" (*Met.* XI 1066^{a}35–^{b}5). Magnitude and plurality are attributes of quantity. See I 2 185^{a}23n.

Note 26

The universe (*to pan*): *To pan* ("the all") usually refers not to the totality of things, but to the spatio-temporal universe and its contents. At *Met.* I 2 982^{b}17 *to pan* is something that comes to be; at 3 984^{b}2 it is *nature* as a whole (984^{a}31; compare XII 8 1074^{b}3, 10 1075^{a}11); at I 4 984^{b}26, 985^{a}25 it is something that comes to be and gets divided into the various elements by strife; at 5 986^{b}10–11, 17, and 8 988^{b}22 it is material and corporeal; at XI 10 1067^{a}3, 15, 16, 19, 22, *to pan* is again something that has material body. That is why, for example, Aristotle can claim that everything (= everything that is a part of the universe) has matter and a moving cause (XII 5 1071^{a}33–34)—something that is manifestly false of all the substances he recognizes, which include the immaterial primary (or prime) mover (6 1071^{b}20–21). Here, however, *to pan* refers to everything—to every being whatsoever.

Note 27

Continuous (*sunechês*): "Two things are continuous when the limits of each, by which they make contact and by which they are kept together, become one and the same" (*Met.* XI 12 1069^{a}5–7).

Now things are said to be one if they are [1] continuous, or [2] indivisible, or if [3] the account of their essence is one and the same: In *Met.* V 6, Aristotle's focal discussion of the different ways in which things are said to be one, he distinguishes ways in which things are said to be coincidentally one from those in which they are said to be intrinsically one. The latter are the ones relevant here (*Ph.* I 2 185^{b}1). Of these, [1] is the first he mentions: "Of things said to be one intrinsically, some are said to be so because they are continuous—for example, a bundle [is one] because of being tied together, and pieces of wood, because of being glued together. And a line, even if bent, is said to be one if it is continuous, as is each part—for example, a leg or an arm. Of these themselves, the continuous by nature are more one than the continuous by craft. A thing is said to be continuous when its movement is intrinsically one and cannot be otherwise, and a movement is one when it is indivisible, and indivisible with respect to time. And things are intrinsically continuous when they are one but not [merely] by contact" (*Met.* V 6 1015^{b}34–1016^{a}7). [3] is the second of ways of being intrinsically one mentioned: "Further, things are said to be one when the account that states the essence is indivisible from another that makes the thing clear" (1016^{a}33–34).

[2], on the other hand, is mentioned in connection with what it is or means to be one (1016^{b}17–18): "In every case, however, what is one is indivisible either in quantity or in form. Now what is indivisible in quantity, when it is indivisible in all dimensions and lacks position, is said to be a *unit*, and when it is indivisible in all dimensions and has position, a *point*. What is divisible in quantity in one dimension is a *line*, in two a *plane*, in all—that is, in three—a *body*" (1016^{b}23–31). The distinction between being one in number (quantity) and in form: "some things are one in number, others in form, others in kind (*genos*), others by analogy: in number, those whose matter is one; in form (*eidos*), those whose account is one; in kind (*genos*), those whose figure of predication is the same; by analogy, those related as another thing is to another thing" (1016^{b}31–35). Being one in form is omitted in our text because it is obviously too weak a way of being one for the globally monistic purposes of Melissus and Parmenides: Democritus' atoms are all of one kind, but numerically many (*Ph.* I 2 184^{b}21). For the same reason, Aristotle omits mention here of things that are said to be intrinsically one "whose genus is one, although distinguished by opposite differentiae" (1016^{a}24–25).

Essence (*to ti ên einai*): See I 2 185^{a}13n.

Like liquor (*methu*) **and booze** (*oinos*): *Methu* and *oinos* both mean "wine."

Note 28

Their being is many: Reading πολλὰ τὸ ὄν with P for OCT πολλὰ τὸ ἕν (their one is many").

Note 29

In nothing at all will there be a quality or a quantity: Because qualities and quantities are attributes of underlying substantial subjects, from which they are distinct but on which their existence depends (I 2 185^{b}3–5n).

Or limited, as Parmenides does: See DK B8 = TEGP 17 F8.29–49.

Note 30

It is limits that are indivisible, not limited things: Thus a line is divisible, but its termini, which are points, are not. See *Met.* V 6 1016^{b}23–31 (quoted in 185^{b}8n).

Note 31

The Heraclitean argument: See 185^{a}7n.

Note 32

The being for good (*agathô[i] einai*): The being for A = what A is intrinsically = the essence of A (*Met.* VII 4 1029^{b}13–1030^{b}13).

Their argument will be, not that all beings are one, but that they are nothing at all: Because for anything, A, that we say the beings are, it is also the case that they are not A.

Note 33

Lycophron: The expressions attributed to him at *Rh.* III 3 1405^{b}35–36, 1406^{a}7–9 suggest that he was a follower or imitator of Gorgias. He is also mentioned at *Pol.* III 9 1280^{b}10–11 where he is referred to as "Lycophron the sophist." It seems that he, unlike the others mentioned, may have allowed *to estin* to be applied—in what we would call its existential sense (I 2 184^{b}22n)—to substances, as in *ho anthrôpos estin* ("the human exists") but not its copulative or predicative use, as in *ho anthrôpos leukos estin* ("the human is pale").

Others remodeled the language: Various candidates have been suggested, including Antisthenes of Athens, who was a follower of Socrates (see *Met.* V 28 1024^{b}32–34), and the Megarians (on whom see IX 3).

Lest by adding the "is" they would make the one be many: Since if an "is" of predication is added, we have two beings related by it, the human on the one hand and the pale (*pallor*) on the other.

Note 34

A thing can be one either potentially or actually: As a line can be actually one, because continuous, and potentially many, because divisible.

Potentially (*dunamei*): The term *dunamis* (plural: *dunameis*) is used by Aristotle to capture two different but related things. (1) As in ordinary Greek, it signifies a power or capacity something has, especially to cause movement in something else (productive *dunamis*) or to be caused to move by something else (passive *dunamis*). (2) It signifies a way of being, namely, potential (*dunamei*) being as opposed to actual (*entelecheia[i]*) or active (*energeia[i])* being. Context usually makes clear which is intended. See also *Met.* V 12.

Actually (*entelecheia[i]*): The term *energeia* is an Aristotelian coinage, which I have translated as "activation" when it is being predicated of something, and as "activity" when it is not. The dative or adverbial form *energeia[i]* is translated as "active" or "actively," in order to signal its relation to *energeia*. The etymology of the coinage is unclear, but Aristotle is explicit that it has been extended from movement to other things (*Met.* IX 1 1046^{a}1–2, 3 1047^{a}30–32), and that it is related to another term with an *erg-* root, namely, *ergon*: "The *ergon* ('function,' 'work') is the *telos* ('end'), and the *energeia* is the *ergon*, and that is why the name *energeia* is said [of things] with reference to the *ergon* and extends to the *entelecheian* ('actuality')" (8 1050^{a}21–23). *Entelecheia*, which is mostly used as a synonym of *energeia*, but with a slightly different connotation, is also an Aristotelian coinage: *energeia* is action, activity, and movement oriented; *entelecheia*—as the *tel-* suggests—is end or *telos* or completion (*enteles*) oriented (V 16 1021^{b}24–30). The dative or adverbial form *entelecheia[i]* is translated as "actual" or "actually." The *energeia of* is translated as "the activation of" and *entelecheia of* as "the actualization of." Putting all this together: the activation or actualization of X is an activity, which is X active or actual, which is X achieving its end, which—since "the for-the-sake-of-which is the function" (III 2 996^{b}7)—is X fulfilling its function, and being actively or actually X, and so being complete.

It is natural to wonder why, with *energeia* already at his disposal, Aristotle bothered to introduce an entirely new term with a very similar application. One suggestion is that the need stems from psychology. Aristotle has to distinguish (a) a dead animal from an animate one and (b) a dormant or sleeping live animal from an active or awake one. *Energeia* recommends itself for (b). But how, then, to distinguish the level of activity in (a) that constitutes the possession of a soul? That is where *entelecheia* comes in: the soul is "the first *entelecheia* of a natural body that has instrumental parts" (*DA* II 2 412^{a}27–^{b}6). This may well be true, but it is interesting that in a case where *energeia* seems yet more unfortunate in its connotations, Aristotle uses it anyway: "What is stillness? Quietness in a large quantity of air. The air is matter; the quietness is *energeia* and substance" (*Met.* VIII 2 1043^{a}23–24). In fact, he also uses it for the soul, which is the *energeia* of a certain sort of body (3 1043^{a}35–36).

Note 35

Deduce (*sullogizontai*): When a deduction (*sullogismos*) is a syllogism proper (also *sullogismos*) it consists of a major premise, a minor premise, and a conclusion, where the premises have exactly one "middle" term in common, and the conclusion contains only the other two "extreme" terms (I 1 184^{a}10n(3)). At *APr.* I 32 47^{a}33–35 a syllogism is distinguished from a "necessity" (or what we would call a valid deduction) on the grounds that not all necessities are syllogisms. Since Aristotle sometimes seems to use *syllogismos* and *syllogizesthai* to cover both valid deductions and syllogisms proper, I translate these as "deduction" and "deduce" rather than as "syllogism" and "syllogize."

Contentiously (*eristikôs*): See I 2 185^{a}8n.

186^{a}7–10: Deleted with OCT. See I 2 185^{a}8–12n.

Note 36

He thinks that if he has as an assumption that whatever comes to be has a starting-point, he also has that whatever has not come to be does not have one: "Melissus' argument that the universe is unlimited assumes that the universe has not come to be (since nothing could possibly come to be from what is not) and that what has come to be has come to be from a starting-point. If, then, the universe has not come to be, it has no starting-point, and so is unlimited. But this does not necessarily follow. For if what has come to be always has a starting-point, it does not follow that what has a starting-point has come to be, any more than it follows that if the person with a fever is hot, then the person who is hot must have a fever" (*SE* 5 167^{b}13–20; also 6 168^{b}35–169^{a}5, 29 181^{a}27–29). It is not clear that Melissus does reason in this fallacious way for the conclusion Aristotle specifies (see DK B1 = TEGP 9 F1).

Note 37

In all cases there is a starting-point of the thing—not of the time: Aristotle is objecting to the view that an alteration in a thing must have a (spatial) starting-point in the thing, not that the change must have a temporal starting-point.

Not [merely] of unconditional coming to be but also of alteration: See V 1 225^{a}13–20.

Unconditionally (*haplês*): The adjective *haplous* means "simple" or "single-fold." The adverb *haplôs* thus points in two somewhat opposed directions. (1) To speak *haplôs* sometimes means, as here, to put things simply or in general terms, so that qualifications and conditions will need to be added later. (2) Sometimes to be F *haplôs* means to be F unconditionally, or in a way that allows for no ifs, ands, or buts (as at *Top.* II 11 115^{b}29–35). In this sense, some things that are F *haplôs* are F in the strictest, most absolute, and most unqualified way (*Met.* V 5 1015^{b}11–12), so that what is unconditionally F is what is intrinsically F (*NE* VII 9 1151^{b}2–3).

Alteration: "There is alteration (*alloiôsis*) when the underlying subject remains and is perceptible but change occurs in the attribute that belongs to it, whether these are contraries or intermediates" (*GC* I 4 319^{b}10–12; also *Ph.* VII 3 245^{b}4–5).

As if change never came about all at once: Aristotle says that water freezes all at once (VIII 3 253^{b}23–26), so that there is no starting-point of its freezing—no part of it that freezes first (VI 5 236^{a}27–28).

Change (*metabolê*): A *kinêsis* in the broad sense is a change (*metabolê*) of any sort (III 1 201^{a}8–9). But sometimes a *kinêsis* is more narrowly a movement or change with respect to place, so that a coming to be (passing away) is a *metabolê* but not a *kinêsis* (*Ph.* V 1 225^{b}7–9).

Note 38

If a part of it that is one—for example, this water here—can be moving within itself, why can't the universe also be moving within itself: If Melissus assumed that for the universe to move there must be an empty space for it to move into, which would involve the prohibited existence of what is not, of something outside being, then this argument, which appeals to the existence of internal swirls or vortexes, is effective against him. See IV 7 214^{a}26–32. In DK F7 = TEGP 15 F7. However, Melissus seems to argue against internal rearrangement or movement of the universe (U) by appeal to what we call Leibniz's law, which states that if A = B then, for all attributes F, F belongs to A $\supset$ F belongs to B, and F belongs to B $\supset$ F belongs to A. Thus if at time t_1 U has the attribute of being arranged in way_1 and if at time t_2 U* has the attribute of being arranged in a distinct way_2 then $U \neq U^*$. Arrangement change, in other words, is inconsistent with the numerical identity of U over time. Aristotle's next point might be taken as a response to this argument.

Note 39
Contraries are distinct in species from each other: See I 2 184^b22n.

Note 40
Things are said to be unconditionally (*haplôs*): So that "being" signifies one thing (186^a26–27). On *haplôs*, see I 3 186^a15n.

Note 41
The pale will not be one by being continuous, nor by being one in account: See I 2 185^b7–9n.

Note 42
The being for pale will be distinct from the being of its recipient: On "the being for X," see I 2 185^b22n, and on recipient, VII 4 248^b21n.

Note 43
There will not be anything beyond the pale that is separable: "Pale" is serving as a doppelganger for Parmenides' "being," which in this phase of the argument is being taken as signifying one thing (I 3 186^a26–27). Even granting that, however, which the first phase of the argument (186^a24–25) denies, it will not follow that being is one. For even if "being" signifies one thing, and even if there is nothing beyond being and separable from it, as Parmenides claims, still the being for being ≠ the being for its recipient (or what it belongs to), with the result that there can still be many such recipients—many beings. This is perhaps easier to see in the case of pale than of being, but the fact remains that even if there is only one way to be a being there can still be many beings that are beings in that one way. On separable, see I 2 185^a31n.

Note 44
This Parmenides did not get far enough to see: Because no one prior to Plato had a "share in dialectic" (*Met.* I 6 987^b32–33), and "strength in dialectic" (XIII 1078^b25) is precisely what is required to dissolve arguments, like those of Parmenides. See I 2 184^b25–185^a12.

Note 45
"Being" . . . signifies just being (*hoper on*) **and just one** (*hoper hen*): "Things that signify substances signify—about what they are predicated of—just what that thing is or just what sort it is. Things that do not signify substances but are said of some other underlying subject, which is neither just what that thing is nor just what sort it is, are coincidents—for example, to say of the human [that it is] the pale. For the human is neither just [what] pale [is] (*hoper leukon*) nor just [what] sort pale [is], but instead, presumably, animal, since animal is just what the human is. Things that do not signify substances must be predicated of some underlying

subject, and there cannot be anything pale that is not pale in virtue of being some other thing" (*APo.* I 22 83ᵃ24–32). Thus what Parmenides must assume is not simply that "being" and "one" signify one thing, but that the one thing they signify is the very thing they are predicated of, so that only being is a being, and only being is a one.

***Hoper*:** Thus to say that A is *hoper* B is to say that A is just, or precisely, or essentially B, or a more specific way of being B. See *Top.* III 1 116ᵃ23–28, IV 2 122ᵇ18–20.

Note 46

For a coincident is said of some underlying subject, so that if being is a coincident, the underlying subject will not be (for it is distinct from being), and, therefore, there will be something that is not: "When I say that the log is white, I do not say that another thing (*heteron ti*) is white and that thing is coincidentally a log. . . . The log is the underlying subject, which is just what came to be white, without being another thing (*heteron ti*) than just (*hoper*) what is a log or a particular log" (*APo.* I 22 83ᵃ9–14; also I 4 73ᵇ5–10). As the log is intrinsically a log (but coincidentally white), so Parmenides' being is one and being not because it is coincidentally another thing A and A is intrinsically one and being, but because it is itself intrinsically one and being. Suppose, then, that being is a coincident of X, so that X ≠ being. Then X will not be, since there is no being, Y, such that X = Y. Therefore, there will be something (namely, X) that is not, or that is not a being, contrary to what Parmenides claims: "Never shall this prevail, that things that are not [beings] are [beings]" (DK B7 = TEGP 16 F7).

Coincident (*sumbebêkos*): Or "coincidental attribute" is defined at 186ᵇ18–23.

Note 47

The pale (*to leukon*): *To leukon* is probably not the universal *pallor*, but *to ti leukon*, a particular instance of pale, whose presence in a particular substance, A, makes it true that it coincides with A and that A is predicatively pale (*Cat.* 2 1ᵃ27–28). Compare *hê tis grammatikê* at 2 1ᵃ25–26, ᵇ8. The idea then is that just being coincides with something that does not exist, and so does not exist itself.

Note 48

It is true to say that it is pale, but this signified not being: (1) Pale ≠ just being, since it is a coincident of it. (2) The being for pale ≠ just being. (3) Being = just being (explicit at I 3 186ᵇ13). (4) The being for pale ≠ being. (5) The pale is not (a being). (6) Just being is pale. (7) Just being is not (a being).

Note 49

That just being is divided into another just being is evident even from the [definition of an] account: Because "intrinsically every account is divisible" (*Met.* V 6 1016ᵃ34–35).

Note 50

Suppose the human is just being, then the animal is also just being, as is the two-footed: Reading εἰ ἔστιν ὅπερ ὄν with Charlton and P for OCT εἰ ἔστιν ὅπερ ὄν τι (“suppose that the human is a thing that is just being”). This follows because the account of the human is “the two-footed animal.”

The human (*ho anthrôpos*): Noun phrases consisting of the definite article plus a noun (“the N”) are similarly ambiguous (homonymous) in English, since they can be either singular terms referring to unique particulars (“The dog bit me,” “The man looked at me crossly”) or generic terms (“The bat is a nocturnal creature,” “The human is a predatory animal,” “The potato is indigenous to South America”). Similarly in Greek “something is said to be the circle homonymously, [since the term is applied] both to the one said to be such unconditionally [the generic or universal circle] and to the particular one” (*Met.* VII 10 1035^{b}1–3).

Note 51

186^{b}20–21: Omitting ἢ ἐν ᾧ ὁ λόγος ὑπάρχει ᾧ συμβέβηκεν (“or if account of that to which the coincident belongs is present in it”) with OCT.

Note 52

Being seated (*to kathêsthai*) **is a coincident as separable** (*chôrizomenon*): The claim is not that being seated is separable (*chôriston*), in the technical sense of that term (I 2 185^{a}31n), from whatever substantial subject it is coincident with, but simply that what is seated can just as well be not seated as seated.

The snub: “Of things defined, however, that is, of the ‘whats’ that things are, some are the way the snub is, others the way the concave is. And these differ because the snub is grasped in combination with the matter (for the snub is a concave *nose*), whereas the concavity is without perceptible matter” (*Met.* VI 1 1025^{b}30–34). This is the sort of intrinsic coincident mentioned at *APo.* I 4 73^{a}34–37 (= I 1 184^{a}10n6(b)).

Note 53

[1] But we must take it that just being is not a coincident of anything at all, and that [2] if both of two things are said of something, so also must that which they compose. [3] The universe, therefore, will be composed of indivisibles: The assumption of the argument is that just being = the human (I 3 186^{b}15–16). Hence [1] we cannot take the human to be a coincident of something else X, since then it would not be identical to X, and there would be more than one being, namely, just being and X. But the human = the animal + the two-footed. So if the human were said (or were a coincident) of X, then [2] the animal and the two-footed would also be said of and be coincidents of X. From [1] and [2], we get that the animal and the two-footed have the same status as the human, and so have the same status as just being. In other words, the animal and the two-footed are distinct beings. If the animal and the two-footed do not have definitional accounts, we can stop there, since they will be indivisibles. If they do have definitional accounts, eventually these too must bottom out in indivisibles. Hence just being will eventually bottom out in as many indivisible beings as its definitional account makes reference to when fully spelled out. But the universe = just being (2 185^{b}7). Hence [3] the universe will be composed of indivisibles.

The universe, therefore, will be composed of indivisibles: Reading ἐξ ἀδιαιρέτων ἄρα τὸ πᾶν. OCT treats the phrase as a question.

Note 54

Some thinkers did, in fact, give in to both arguments: [1] to the argument that all things will be one if "being" signified one thing, when they posited that not being (*to mê on*) will exist; and to [2] the argument from the divisions into two (*ek tês dichotomias*) when they posited indivisible magnitudes: [1] is gone through at I 3 186^{a}24–^{b}14; and [2] at 186^{b}14–35. [2] is referred to as "from the divisions into two" because in it the human (= just being) is divided into two things: the animal and the two-footed. Further divisions of these two, if there are any, will also be into at least two elements, since otherwise it would not be complex, as an account must be (186^{b}14–15). Another possibility, though surely a less attractive one, is that [2] refers to some argument—perhaps one due to Zeno (Ross, pp. 479–481)—that Aristotle has not previously discussed.

Note 55

Nothing prevents not being from not being *something*, but from *simply* not being: "Not being [is said of things] in many ways too, since being is, and not being a human signifies not being a this, not being straight signifies not being of such-and-such sort, not being three cubits signifies not being so-and-so much" (*Met.* XIV 9 1089^{a}16–19). Hence just as there is no such thing as just being, as there would be if "being" signified one thing, rather than being said of things in many ways, so there is no such thing as just not being, or simply not being.

Note 56

Who does learn (*manthanei*) about being itself if there were not something for just being to be? *Manthanein*, at any rate in its most common meaning, seems an odd verb to choose. But Parmenides, we should remember, claims to have been taught his philosophical views from a goddess (DK B1 = TEGP 10 F1 22), who tells him that from her he will "learn (*mathêseai*) the opinions of mortals" (F1 31; *manthane* at F8, 52). So Aristotle may be taking a poke at him. If the goddess did not tell him something (else) that being itself (= just being) is, how can he have learned what it is from her?

Note 57

The physicists: See I 2 184^{b}17n.

Either one of the three: "None of those who say that it is one thought that earth is the element, clearly because of the largeness of its parts, whereas of the three [other candidate] elements each has found some judge in its favor, for some say that this is fire, others that it is water, others that it is air" (*Met.* I 8 989^{a}5–8).

Or something else that is denser than fire and rarer than air: It is unclear who held this view, which is also mentioned without specific attribution at *GC* II 1 328^{b}35, 5 332^{a}21, *Met.* I 7 988^{a}30–31.

Note 58

Now these are contraries: See I 2 184^{b}22n.

Which taken universally are excess and deficiency (*huperochê kai elleipsis*): "We must, then, get hold of the kinds (*genos*) of the differentiae—for these are going to be starting-points of the being. For example, the ones differentiated by the more and less, or by dense and by rare, or by others of this sort. For all these are [kinds of] excess and deficiency" (*Met.* VIII 2 1042^{b}31–35).

The great and the small in Plato: *Ph.* IV 2 209^{b}7–16, 209^{b}33–210^{a}2 suggest that Aristotle is drawing on the unwritten doctrines in attributing the great and the small—or "the indefinite dyad (*hê aoristos duas*)" (*Met.* XII 8 1083^{b}36, XIV 1 1088^{a}15–16, 3 1091^{a}5)—as a material starting-point to Plato, who does, however, describe the unlimited as "the more and the less" (*Phlb.* 24c–d).

Except that he makes these be matter, and the one be form: "And since the Forms are causes of the other things, he thought that their elements were the elements of all beings. It is as matter, then, that the great and the small were starting-points, and as substance [= form, essence], the one. For generated [as they are] from the great and the small by participating in the one, the Forms are the numbers" (*Met.* I 6 987^{b}18–22).

Differentiae (*diaphoras*): *Diaphorai* are sometimes the differentiae that divide a genus into species, and so define each of its species, and are sometimes simply the different features that distinguish one kind of thing from another, without necessarily suggesting that the kinds are genera or species in the strict sense or that the differences are differentiae. The Greek term is added in parenthesis when needed for clarity.

Note 59

The beings are one and many: Reading εἶναι τὰ ὄντα with P for OCT εἶναι.

Note 60

Anaximander (of Miletus): DK B1 = TEGP 45–71.

Empedocles (of Acragas): DK 31 = TEGP 326–433.

Anaxagoras (of Clazomenae): DK 59 = TEGP 271–325.

Note 61

Homoeomerous things (*homoiomerê*): Something is homoeomerous in the strict sense if its parts, however small, are of the same sort as the whole—as parts of water, however small, are (or were thought to be) water too (*PA* I 2 647^{b}17–20).

Empedocles posits the so-called elements only: "Empedocles, however, posits four things, positing earth along with those already mentioned as a fourth (for these, he says, always persist and do not come to be, except in quantity or smallness, aggregating into one and disaggregating from one)" (*Met.* I 3 984^{a}8–11 = DK A28 = TEGP 28). He was probably the first philosopher to take just these as elements and starting-points. His aggregating agent is love, his disaggregating agent, strife. See TEGP 41 F20, and *Met.* I 4 985^{a}21–^{b}4 for some discussion and criticism.

Note 62

Anaxagoras makes a thing's coming to be such-and-such an alteration: But he was thereby "ignorant of the proper sense of his utterance" (GC I 1 314^{a}13), since

"he says that the elements are many" (314^{a}15), and so ought to distinguish coming to be and passing away from alteration.
Alteration: I 3 186^{a}15n.

Note 63
Things come to be from beings that are already present but that, because of the smallness of their volume, are imperceptible to us: "All things were together, unlimited both in number and in smallness; for the small was unlimited too. And because all things were together no thing was clear, due to its smallness" (Anaxagoras, DK B1 = TEGP 11 F1).

Note 64
That is why they say that everything has been mixed together in everything: "In everything there is a portion of everything" (Anaxagoras, DK B11 = TEGP 30 F14).
They saw everything coming to be from everything: As Thales is said to have reached his supposition that the starting-point of all things is water "from seeing that the nourishment for all things is moist, that the hot itself comes to be from this, and what is alive lives by this" (*Met.* I 3 983^{b}20–24).

Note 65
Whichever it has most of is what seems to be the nature of the thing: "No other thing is like anything else, each one is and was most clearly those things of which it has the most" (Anaxagoras, DK B12 = TEGP 31 F15).

Note 66
If the unlimited insofar as it is unlimited is unknowable: As Aristotle himself agrees it is: "It is impossible to have knowledge until we come to indivisibles. And knowing anything is impossible [if there are none]. For how can there possibly be understanding of what is unlimited in this way [namely, in definition]? . . . At any rate the [definition of] what is unlimited is not unlimited. But then if the kinds (*eidos*) of causes *were* unlimited in number, knowledge would again be impossible. For we think we know when we know the causes, but what is unlimited by addition cannot be gone through in a limited time" (*Met.* II 2 994^{b}21–31).
The unlimited in form (*eidos*) **is an unknowable quality** (*poion*): "What is said in one way to be a quality (*poion*) is a differentia of substance. For example, human is animal qualified in a certain way, because two-footed, horse because four-footed" (*Met.* V 14 1020^{a}33–34). Thus if something—a genus—were unlimited in form (or species), it would have an unlimited number of differentia, and so its definition would be unknowable.

Note 67
If, on the other hand, it is impossible for an animal or a plant to be of any size whatsoever: Reading εἰ δὲ ἀδύνατον with P and the mss. for OCT εἰ δὴ ἀδύνατον ("if, then, it is impossible . . .").

Note 68

It will not be smaller than a certain magnitude: Since it is impossible for the parts of an animal or a plant to be of any size whatsoever, whether large or small (I 4 187^{b}13–21).

Note 69

Attributes are inseparable: See I 2 185^{a}31n.

Attributes (*pathê*): What X *paschei* ("suffers" or "undergoes") is what happens to him, so that he is passive with respect to it, as opposed to what he *poiei* ("does as an agent," or "produces"). When Y does something to X, X is affected by it, so his *pathê* as a result are, in one sense, his affections or attributes and, in another, his passions or feelings.

Note 70

States (*hexeis*): A state (*hexis*) is the penultimate stage in the development or bringing to completion of a capacity, and is a relatively stable condition (*Cat.* 8 8^{b}25–9^{a}13) ensuring that a thing is "either well or ill disposed, and either intrinsically or with reference to something else—for example, health is a state, since it is a disposition of this sort" (*Met.* V 20 1022^{b}10–12).

There would be a pale or a healthy that is not another thing (*ouch heteron to on*): See I 3 186^{a}34–^{b}2n.

Note 71

***Nous* is absurd, since it is seeking impossible things:** "And when *nous* began to cause movement, as a result of everything being in movement there was a segregation, and to the extent that *nous* causes movement everything was segregated. And with everything being in movement and being segregated the revolution caused a much greater segregation" (Anaxagoras, DK B13 = TEGP 33 F16).

Note 72

Things of the same form (*homoeidês*): The term *homoeidês* is applied to air (I 5 411^{a}21), water (*Met.* V 3 1014^{a}30–31), and fire (*Cael.* I 8 276^{b}5–7), whose parts are the same in form as the whole, but also to members of the same species (*Met.* VII 7 1032^{a}24, XII 5 1071^{a}17).

Note 73

There is a way in which mud is divided into mud, and a way in which it is not: On Anaxagoras' view what we call mud is actually a mixture of particles of all things in which particles of mud predominate. So mud can be divided into mud. But in another way it can be divided into water and clay in neither of which, contrary to Anaxagoras, is any mud present.

Note 74

The way in which bricks come from a house and a house from bricks is not the same as the way in which water and air are and come from each other: The bricks into which a house is decomposed and the bricks from which it is composed are numerically the same and the same in kind. They undergo no intrinsic change either way. On Aristotle's view the elements earth, water, air, and fire, though they are by definition the most primitive of sublunary bodies, can nonetheless change into one another (*Cael.* III 6 305^{a}31–32) in a way determined by their ultimate differentiae—hot, cold, wet, dry (*A* 8 989^{a}16n). If elements are adjacent, so that like earth (cold, dry) and water (cold, wet), they share a differentia, transformation occurs when one of the differentia masters its contrary (*GC* II 4 331^{a}27–30). Hence no earth—nothing cold and dry—is actually present in the water that earth becomes.

Note 75

It is better to assume a smaller number of starting-points: See VIII 6 259^{a}9–10, 187^{b}7–8n.

Just as Empedocles does: See I 4 187^{a}26n.

Note 76

In fact Parmenides posits hot and cold as starting-points, though he calls them by the names "fire" and "earth": "Here I cease from my trustworthy account and understanding of truth; from this point on learn mortal beliefs, hearing the deceptive order of my words. For they made up their minds to name two forms (*morphas*), of which it is wrong to name one—this where they have gone astray—and they discerned contraries in bodies and set signs apart from each other: to this form the eternal fire of flame, being gentle, very light, everywhere the same as itself, not the same as the other; but also that one by itself, contrarily unintelligent night, a dense body and heavy. I declare to you this arrangement to be completely likely, so that no judgment of mortals will ever surpass you" (DK B8 = TEGP 17 F8.50–61).

Note 77

Democritus who posits plenum and void (saying that the one is present as being the other as not being), but further posits position, shape, and order: See I 2 184^{b}21n.

Note 78

But how this conclusion follows must also be investigated by appeal to argument (*epi tou logou*): At I 5 188^{b}29 the thinkers under consideration here are said to "do so without argument" for the view that the starting-points are contraries, but were rather "compelled by the truth itself" to do so. At VIII 8 262^{a}16–19, appeal to argument is contrasted with appeal to perception. At *Met.* I 3 984^{b}10 being "compelled by the truth itself" is offered as equivalent in meaning to "the facts themselves (*auto to pragma*)" at 984^{a}18–19. Putting all this together we should take Aristotle to be saying the following: "Previous thinkers posited contraries as starting-points, on the basis of perception (*Ph.* I 4 187^{b}2). And this was reasonable, because the primary contraries have both of the features requisite in a starting-point. But they gave no argument in support of this, basing it on perception alone."

Note 79

A coincidental case: That is a case of coincidental causation—on which, see II 5 196^{b}24–27.

Note 80

Unless musical were coincident with the not pale or with the dark: That is, unless musical and pale or dark were coincidental attributes of the same substantial subject.

Note 81

The same account also holds of the beings that are not simple but composite: The composites in question are matter-form compounds.

Note 82

But because the opposite dispositions have no names, this escapes notice: "As for that from which, as matter, they come to be, some, when they have come to be, are said not to be *that* but *thaten*—for example, a statue is not said to be stone, but *stonen*. The human being who is healthy, by contrast, is not said to be of that from which he comes. The cause of this is that although he comes to be from both the lack and from the underlying subject, which we call the matter (for example, it is both the human and the sick that come to be healthy), it is rather from the lack, nevertheless, that he is said to come to be—for example, healthy comes from sick rather than from human. That is why the healthy one is not said to be sick, but is said to be human, and the human is said to be healthy. In cases where the lacks are unclear or nameless, however, such as the lack of whatever shape it happens to be in bronze, or that of a house in bricks and timbers, the thing seems to come to be from these materials as in the previous case it did from being sick" (*Met.* VII 7 1033^{a}5–16).

Dispositions (*diatheseis*): "What is said to be a *diathesis* is the arrangement of what has parts with respect either to place or capacity or form. For it must be some sort of position, as the name "dis*position*" also makes clear" (*Met.* V 19 1022^{b}1–3).

Note 83

A house come to be from the non-combination, or rather division, of these things in this way (*tadi hôdi*): "Some things presumably are this [form] in this [matter], or these things in this state (*hôdi tadi echonta*)" (*Met.* VII 11 1036^{b}23–24); "If we had to define . . . a house, we would say bricks and timbers placed this way (*hôdi*)" (VIII 2 1043^{a}7–9).

Note 84

Each of these things is on the one hand an order, and on the other a sort of composition: The order is the formal element, which can be either had (harmony, order, composition) or lacked (their opposites); the composition is the matter-form compound (the house, the statue).

Note 85

The intermediates are [composed] of contraries: The proof is given in *Met.* X 7.

For example, colors from black and white: "Such, then, is a possible way of conceiving of the existence of a plurality of colors besides white and black, but which are a plurality because of the ratio [of white to black that constitutes them]; for they [white and black] may be juxtaposed in the ratio 3:2 or 3:4, or in ratios expressible by other numbers, or they may be in no numerically expressible ratio, but in some incommensurable relation of excess or deficiency" (*Sens.* 3 439^{b}25–30); "The other colors are seen to come to be from this [the white] and the black, and the black is the lack of white, just as dark is of light" (*Met.* X 2 1053^{b}30–32); "We might say that there are three starting-points—the form, the lack, and the matter. But each of these is distinct for each category (*genos*)—for example, in colors they are white, black, and surface, or light, darkness, and air, out of which day and night come to be" (XII 4 1070^{b}18–21).

Note 86

As we said earlier: At I 5 188^{a}19–30.

Note 87

Compelled by the truth itself: See I 5 188^{a}30–31n.

Note 88

Some take contraries that are prior, some contraries that are posterior: Those more knowable by perception are prior (in knowledge) to those more knowable by reason, since perception, which if of particulars, is an earlier stage in the inductive process that leads from it to a grasp by reason (understanding) of the relevant universal. See I 2 185^{a}14n.

Some contraries that are more knowable by reason (*kata ton logon*): Or, "more knowable by an account." Compare: "[Parmenides] takes it that there is one thing according to reason but more than one according to perception" (*Met.* I 5 986^{b}31–33).

Others that are more knowable by perception: See I 5 189^{a}8–9n.

Note 89

Some posit hot and cold as the causes of coming to be: For example, Parmenides (I 5 188^{a}20n).

Others wet and dry: Probably Xenophanes of Colophon.

Others odd and even: The Pythagoreans. See *Met.* I 5 986^{a}23–24.

Or strife and love: Empedocles of Acragas. See DK B17 = TEGP 41 F20, B21 = TEGP 45 F22, B35 = TEGP 51 F28, B122 = TEGP 183 F129, B115 = TEGP 25 F8.

Note 90

They are taken from the same column (*sustoichias*) **of contraries:** At *Met.* I 5 996^{a}22–26, Aristotle speaks of the Pythagoreans as arranging their ten starting-points in two columns of contraries:

limited	unlimited
odd	even
one	plurality
right	left
male	female
being at rest	moving
straight	curved
light	darkness
good	bad
square	rectangular

At XIV 6 1093^{b}12–13, he refers to the first column as being that of good ones (*NE* I 6 1096^{b}6) or beautiful ones, the second that of bad or evil ones. At IV 2 1004^{b}27 he refers to a column of contraries, one column consisting of "positive" notions, the other of "lacks," or privative ones. XI 9 1066^{a}15, XII 7 1072^{a}31 also refer to this, suggesting that it is a device or way of thinking that Aristotle himself accepts. In speaking of just one column in our text, he is presumably referring to the column of positive notions, from which each of the thinkers he mentions takes one or another member. X 3 1054^{b}35, 8 1058^{a}13 refer to a different sort of *sustoichia*, which is a "line of predication (*sustoichia tês katêgorias*)" or, which seems to be the same notion, a "figure of predication (*schêma tês katêgorias*)" (3 1054^{b}29).

Some of which encompass [others], whereas others are encompassed: The more universal ones encompass, the more particular ones are encompassed.

Encompass (*periechei*): The primary connotation of *periechein* ("encompass," "circumscribe"), which is a compound of the preposition *peri* ("around") and the verb *echein* ("have," "possess"), is that of containing by surrounding.

Note 91

The great and the small are known by reason, the rare and the dense by perception: Aristotle may be recalling the following passage from Plato: "[Socrates] Some sense-perceptions do not summon the understanding to look into them, because the judgment of sense-perception is itself adequate, whereas others encourage it in every way to look into them, because sense-perception does not produce a sound result. . . . The ones that do not summon the understanding are all those that do not at the same time result in an opposite sense-perception. But the ones that do I call *summoners*. That is when sense-perception does not make one thing any more clear than its opposite, regardless of whether what strikes the senses is close by or far away. What I mean will be clearer if you look at it this way: These, we say, are three fingers—the smallest, the second, and the middle finger. . . . Assume that I am talking about them as being seen from close by. Now consider this about them with me. . . . It is obvious, surely, that each of them is equally a finger, and it makes no difference whether it is seen to be in the middle or at either end, whether it is dark or pale, thick or thin, or anything else of that sort. You see, in all these cases, the soul of most people is not compelled to ask the understanding what a finger is, since sight does not at any point suggest to it that a finger is at the same time the opposite of a finger. . . . Now what about their greatness and smallness? Does sight perceive them adequately? Does it make no difference to it whether one of them is in the middle or at the end? And is it the same with the sense of touch as regards thickness and thinness, hardness and softness? What about the other senses, then, do they make such things sufficiently clear? Or doesn't each of them work as follows: In the first place, the sense that deals with hardness must also deal with softness; and it reports to the soul that it perceives the same thing to be both hard and soft. . . . In cases of this sort, then, isn't the soul inevitably puzzled as to what this sense-perception means by hardness, if it says that the same thing is also soft, and in the case of the sense-perception of lightness and heaviness, what it means lightness and heaviness are, if what is heavy is light or what is light heavy. . . . It is likely, then, that it is in cases of this sort that the soul, summoning calculation and

understanding, first tries to determine whether each of the things reported to it is one or two" (*Rep.* VII 523a–524b).
The great and the small: "It is as matter, then, that the great and the small were starting-points [for Plato], and as substance, *the one*" (*Met.* I 6 987^{b}20–21).
The rare and the dense: Posited by Leucippus and Democritus. See Met. I 4 985^{b}11–12.

Note 92
The starting-points cannot be unlimited, since if they were, being would not be scientifically knowable: The argument is given in *Met.* II 2. See also I 1 184^{a}12–14.

Note 93
In any one genus there is just one contrariety: Because contraries must be in the same genus, and contrariety is the greatest difference within a genus. See *Met.* X 4 for the argument.
Substance is one genus (*genos*): *Genos* here, as often elsewhere, is category. See I 1 184^{a}10n(7).

Note 94
Some pairs of contraries are prior to others: As, for example, dense and rare, as kinds of excess and deficiency, are posterior to them, and smooth and rough posterior to straight and curved (*Met.* VIII 2 1042^{b}33–36).
Some come to be from others: Reading ἐξ ἄλλων with Charlton and P for OCT ἐξ ἀλλήλων ("from each other").
Such as sweet and bitter: These "derive from earth and fire and they from hot and cold, just as some have referred hot and cold back to rarefaction and condensation, and they in turn to combination and separation" (Simp. 196.33–35 = Baltussen 36).
White and black: These come to be from light and dark. See I 5 188^{b}24–25.
The starting-points must always remain: They cannot come to be from, or pass away into, other things, or be posterior to them.

Note 95
Some thinkers assume more than one such thing from which they construct the nature of the beings: For example, Empedocles posits four such things. See I 4 187^{a}25–26n.

Note 96
What is a starting-point ought not to be something that is said of an underlying subject: The assumption being that what is predicated of an underlying subject is ontologically dependent on and posterior to that subject—as things in other categories are ontologically dependent on those in the category of substance. See I 2 185^{a}23n.

Note 97
The underlying subject (*hupokeimenon*): In addition to being (1) a subject of predication and (2) what underlies or remains through every change whether in

attributes or in the coming to be or passing away (*Met.* VIII 1 1042^{a}32–^{b}6, *Ph.* I 7 191^{a}13–^{b}10), a *hupokeimenon* can be (3) the subject matter of a science or body of knowledge (*NE* I 3 1094^{b}12).

Note 98

We say that substance is not contrary to substance: "It also belongs to substances that there is nothing contrary to them. For what could be contrary to a primary substance? For example, there is nothing contrary to a particular human [a primary substance], nor yet is there anything contrary to human or animal" (*Cat.* 5 3^{b}24–27).

Note 99

The former argument: The one concluding at I 5 189^{a}9–10 that the starting-points must be contraries.

And this one: That contraries need an underlying subject (I 6 189^{a}21–34).

Water: Thales (*Met.* I 3 983^{b}20–27).

Or fire: Heraclitus and Hippasus of Metapontium (*Met.* I 3 984^{a}7–8).

Or what is intermediate between the two: See I 4 187^{a}14n.

Note 100

Fire, earth, air, and water are already involved with contrarieties: Since fire is hot and dry; earth, cold and dry; air, hot and wet; water, cold and wet (*GC* II 3 330^{a}30–^{b}7).

Earth: "None of those who say that it [the starting-point of all things] is one thought that earth is the element, clearly because of the largeness of its parts, whereas of the three [other candidate] elements each has found some judge in its favor, for some say that this is fire, others that it is water, others that it is air. And yet why don't they also say earth, as ordinary men do? For these say that all things are earth, and Hesiod too says that earth was the first of the bodies to come to be (thus it turns out that the supposition is ancient as well as popular)" (*Met.* I 8 989^{a}5–12).

Note 101

The ones who of these elements make it air: Anaximenes and Diogenes of Apollonia (*Met.* I 3 984^{a}5).

Note 102

Air too has the least perceptible differentiae: Air looks as if it is homogeneous, or without intrinsic differentia. This recommends it as something that can serve as the underlying subject of all the differentiae, including contrary ones. For if it were intrinsically F, it could never be G, if F and G are contrary differentiae.

Note 103

The more and the less: See V 2 226^{b}2n.

Note 104

As was stated previously: At I 4 187^{a}16–17.

Note 105

The ancient thinkers made the two active and the one passive, whereas some of the more recent ones stated the contrary instead, that the one does the affecting and the two the being affected: Aristotle is referring to Anaximenes (ancient) and Plato (more recent). See I 4 187^{a}16–20.

Note 106

There is some reason to think that the elements are three in number, as we said: At I 6 189^{a}20–22.

Note 107

If there are four, there will be two contrarieties: The supposition being that the new fourth starting-point is a contrariety (or pair of contraries) irreducible to the first one (I 5 189^{a}9–10).
And a separate intermediate nature will be needed for each: So there will be five starting-points, not four.
Intermediate nature: That is, underlying subject.

Note 108

If, on the other hand, being [just] two, they can generate things out of each other: If we insist that in adding the new contrariety (pair of contraries) we have increased the number of starting-points to just four, so that we have not added a new underlying subject, then both contrarieties must belong to the same underlying subject. The implication is that one of the pairs, by acting on that underlying subject, can generate the other, making it superfluous to add it as a starting-point. For suppose S is that subject, and the contrariety C_1 between F_1 and F_2 and the contrariety C_2 between G_1 and G_2 are the relevant ones. Well, both C_1 and C_2, taken generally, are excess and deficiency (I 6 189^{b}10–11)—moreover, they are both excess and deficiency of the same underlying subject S. So any point in the interval between G_1 and G_2 must be somewhere in the interval between F_1 and F_2, and so be generable from C_1.

Note 109

But whether they are two or three involves, as we said, much puzzlement: Aristotle has not, in fact, said this before. But he has been tentative about the need for a third element (I 6 189^{a}21, ^{b}17).

Note 110

The procedure that is in accord with nature is first to say what is common to all cases, and then to get a theoretical grasp on what is special to each one: See I 1 184^{a}23–25.
Get a theoretical grasp on (*theôrein*): The verb *theasthai*, with which *theôria* is cognate, means to look at or gaze at. Thus *theôria* itself is sometimes what someone is doing in looking closely at something, or actively observing, studying, or contemplating it, and sometimes the capacity someone has to do these things (*Met.* IX 6 1048^{a}34–35, 8 1045^{a}36). When *theôria* is an exercise of understanding (*nous*), which is the element responsible for grasping scientific starting-points (*NE*

VI 6 1141^{a}7–8), such as (the definition of) right angle in the case of geometry, or (the definition of) happiness in the case of politics, it is translated as "contemplation," and the cognate verb *theôrein* as "contemplate," as at VIII 4 255^{b}2. The corresponding capacity is translated as "theoretical knowledge," and what gives rise to it as "get a theoretical grasp on." So when we get a theoretical grasp on A, we acquire the theoretical scientific knowledge of A, which we exercise in contemplating A.
Special (*idia*): "A special attribute (*idion*) is one that does not reveal the essence of a thing yet belongs to that thing alone and is predicated convertibly of it. Thus it is a special attribute of a human to be receptive of grammar, since if someone is human he is receptive of grammar, and if he is receptive of grammar he is human" (*Top.* I 5 102^{a}18–22).

Note 111

We say: That is, we Aristotelians (rather than we people in genera).
[2] One thing comes to be from another (*ex allou allo*)**, [2] indeed** (*kai*)**, a distinct one from a distinct one** (*ex heterou eteron*): [2] is probably best understood as correcting [1]: "Things are said to be distinct (*hetera*) when either their forms or their matter or the account of their substance are more than one" (*Met.* V 8 1018^{a}9–11).

Note 112

The being for the human (*to anthrôpô[i] einai*) **is not the same as the being for the unmusical:** See I 2 185^{b}22n.

Note 113

This something (*tode ti*): *Tode ti* involves a particularizing element and a generalizing element. I take the demonstrative pronoun *tode* as particularizing (as suggested by *Met.* VII 4 1030^{a}5–6) and the indefinite pronoun *ti* as generalizing, but since *tode* need not be particularizing (as it may not be in 7 1032^{b}6–21) and *ti* may be, it is possible to go the other way and translate as "thing of a certain sort." Often *tode ti* appears in translations simply as "a this," and in at least one place Aristotle himself suggests that *tode* and *ti* are interchangeable (XII 2 1069^{b}9, 11).

(1) In very many cases, as in the present one, being a *tode ti* is a distinctive mark of *ousia* ("substance"), and so has some share in the ambiguity of the latter, as between (1a) an ultimate subject of predication and (2a) the substance or essence of something (I 2 185^{a}23n). This is reflected in the fact that (1b) a particular man and a particular horse are primary substances (*Cat.* 5 2^{a}11–14), so that "it is indisputably true that each of them signifies a *tode ti*" (3^{b}10–12), while at the same time (2b) what is separable and a *tode ti* is "the shape or form of each thing" (*Met.* V 8 1017^{b}24–26; also VIII 1 1042^{a}27–29, IX 7 1049^{a}35, XII 3 1070^{a}11). Some things, to be sure, are one and the same as their forms or essences—which would remove the ambiguity at least in their cases—but it is not true that all are (VII 11 1037^{a}33–^{b}7).

(3) As strong as the connection between substance and being a *tode ti* is the disconnection between being a *tode ti* and being a universal—"no common thing signifies a this something, but rather a such-and-such sort of thing" (*Met.* III 6 1003^{a}8–9; also VII 13 1039^{a}15–16)—and the connection between being substance

and being a *kath' hekaston*: "If we do not posit substances to be separate, and in the way in which the *kath' hekasta* are said to be separate, we will do away with the sort of substance we wish to maintain" (XIII 10 1086^b16–19). Apparently, then, a form that is (2b) a primary substance—as some are explicitly said to be (VII 7 1032^b1–2)—must be a *kath' hekaston*.

(4) A *kath' hekaston*, in turn, is "what is numerically one" (*Met.* III 4 999^b34–1000^a1), and so, (4a) taking "numerically one" to mean that no two things can be one and the same *kath' hekaston*, as no two things can be you or Socrates (VII 14 1039^a34), it is translated as "particular." But it is also possible to take "numerically one" to mean (4b) "indivisible" or "individual," so that like an ultimate differentia—identified with form and substance at VII 12 1038^a25–26—something is *kath' hekaston* because it cannot be further divided or differentiated.

(5) As we try to disambiguate *tode ti*, then, we run into ambiguities that parallel the initial one in substance itself, or that are related to it. That this may be no accident but rather the heart of the issue is suggested by *Met.* XIII 10 1087^a19–21.

(6) Finally a point about matter. What *Ph.* I 7 190^b24–26 refers to as "countable matter (*hulê arithmêtikê*)," and treats as a generalization of such things as the human and the bronze, is "more of a this something," as, no doubt, is the "this wood (*todi to xulon*) of this [box]" at *Met.* IX 7 1049^a24 and the "this (*toudi*), which is bronze" at VII 8 1033^b2, from (some or all of) which the smith makes this brazen sphere. But these are particular identifiable and countable parcels of matter—minimally shaped up by form, perhaps, but enough to count as (anyway low-grade) *tade tina*. Matter taken more generally, however, is "what not being actually a this something, is potentially a this something" (VIII I 1042^a27–28).

Note 114

But that substances—that is, the things that are unconditionally beings: Accepting the OCT seclusion of ἄλλα. If it is retained, we have: "But that [1] substances and [2] all the other things that are unconditionally beings." A reference to artifacts, thought of as non-substances that also come to be from underlying subjects, has been detected in [2]. But artifacts are probably best thought of as (lower-grade) substances. See *Met.* XII 7 1072^a30–$^b1$, where substances of different grades seem to be acknowledged.

Note 115

Shape (*morphê*): That is, form. *Amorphia* ("lack of shape") at I 7 190^b15 is the contrary.

Substance (*ousia*): That is, essence. See I 2 185^a23n.

Coincidentally (*kata sumbebêkos*): See I 3 186^b18–20.

Note 116

For the musical human is composed of human and musical in a way, resolutions of the account of it are into the accounts of these two: Reading διαλύσεις γὰρ τὸν λόγον with P for OCT διαλύσεις γὰρ [τοὺς λόγους]. Musical is a coincidental attribute of human, and so the musical human does not have a substance or essence. However, the musical human is composed of human and musical, and these do have essences, although not in quite the same way. See *Met.* VII 4 1029^{b}22–1030^{a}27. So the account of musical human is resolved into the accounts of its constituents.

Note 117

Lack (*sterêsis*): "One of a pair of contraries is a lack no less [than a contrary], or a lack of substance, and a lack is the denial [of a predicate] to some definite kind (*genos*)" (*Met.* IV 6 1011^{a}18–20). Thus, while a lack can be of one of a pair of contraries, it can also be the lack of something—such as substance—that strictly speaking has no contrary: "It also belongs to substances that there is nothing contrary to them. For what could be contrary to a primary substance? For example, there is nothing contrary to a particular human [a primary substance], nor yet is there anything contrary to human or animal" (*Cat.* 5 3^{b}24–27). Lack of substance (or form) is evidenced in cases of existence changes, where a substance either comes to be or passes away. See also *Met.* X 4 1055^{b}11–29, V 22.

Note 118

Contraries cannot be affected by each other: See I 6 189^{a}20–26, which states the resulting puzzle to which 7 190^{b}33–34 implicitly refers.

Note 119

As for the underlying nature: That is, the underlying subject.

It is scientifically knowable by analogy: "What we wish to say is clear from the particular cases by induction, and we must not look for a definition of everything, but be able to comprehend the analogy, namely, that as what is building is in relation to what is capable of building, and what is awake is in relation to what is asleep, and what is seeing is in relation to what has its eyes closed but has sight, and what has been shaped out of the matter is in relation to the matter, and what has been finished off is to the unfinished. Of the difference exemplified in this analogy let the activity be marked off by the first part, the potentiality by the second. But things are said to actively be, not all in the same way, but by analogy—as this is in this or to this, so that is in that or to that. For some are as movement in relation to a capacity [or a potential], and the others as substance to some sort of matter" (*Met.* IX 6 1048^{a}35–^{b}9).

Note 120

A substance, a this something, and a being: The reason why the third of these goes together with the other two is explained in the following text: "Someone might indeed be puzzled about whether walking and being healthy and sitting are each of them a being or not a being, and similarly too in the case of any other thing of this sort. For none of these is either by its nature intrinsically a being or capable of being separated from substance but, if anything, it is the walking thing that is a being, and the sitting thing, and the one being healthy. These things are evidently beings to a higher degree, because there is some definite underlying subject for them (and this is the substance and the particular)" (*Met.* VII 1 1028^{a}20–27).

Note 121
Another one, the account: Reading μία δὲ ὁ λόγος with P for OCT μία δὲ ἧς ὁ λόγος (“another one is what the account is of”). The account is here, as often, a stand-in for the form that the account is of.

Note 122
First, it was said that only the contraries were starting-points: At I 5 189^{a}9–10. **Later, that it was necessary for there to be something else to underlie them:** At I 6 189^{a}33–^{b}1.

Note 123
The differentia of the contraries (*ê diaphora tôn enantiôn*): What differentiates the members of a pair of contraries is that one is the lack of the other. See I 7 190^{b}10–17.

Note 124
Whether the form or the underlying subject is substance is not yet clear: The compound of matter and form is ruled out as a candidate: “Both separability and being a this something seem to belong most of all to substance, and, because of this, the form and the thing composed of both would seem to be substance more than the matter is. But the substance that is composed of both (I mean of both the matter and the shape) should be set aside. For it is posterior [to the form and the matter]” (*Met.* VII 3 1029^{a}27–31). See also II 1 and Introduction, pp. xxvii–xxxii.

Note 125
Mode (*ho tropos*) **[of being]:** Namely, that one is the lack of the other.

Note 126
Those who were the first to inquire philosophically into the truth and the nature of beings were turned aside, and as it were diverted from their route, by their inexperience: What they were turned away from was the investigation of nature and natural being, and what led to this was their inexperience specifically in dialectic. See I 2 184^{b}25–185^{a}5n.

Note 127
There must be some underlying subject [for it to come from]: Reading δεῖ with P and the mss. for OCT δεῖν.

Note 128
Things do, nonetheless, come to be from what is not: Reading ὅμος with P and most mss. for OCT πὼς.

Note 129
If dog came to be from horse: Rejecting the OCT addition of ἐκ κυνὸς ἢ ἵππος (“if dog came from dog or horse from horse”). The subsequent argument is difficult, but becomes easier to understand if we see it as relying on the following account of what happens in embryological development: “The [male] seed is a residue and moves with the same movement as that in accord with which

the body grows through the distribution of the ultimate nourishment [namely, blood]. When it comes into the uterus it causes the female's residue [that is, the menses] to take shape and moves it in the same movement in which it is itself actually moving. For the menses is also a residue, and contains all the parts [of the body] potentially, though none actually. It even has in it potentially those parts that differentiate female from male. And just as offspring from parents with a disability are sometimes born with a disability and sometimes not, so offspring from a female are sometimes female and sometimes not female but male. For the female is like a male with a disability, and the menses is seed, only not pure. For it does not have one thing in it: the starting-point of the soul" (*GA* II 3 737^{a}18–30); "It is necessary to take hold of the universal hypotheses . . . that some movements [those in the female menses] are present potentially and others [those in the male seed] actually . . . that what gets mastered changes over into the opposite; that what slackens passes into the movement that is next to it: slackening a little into a movement that is close by; more, into one that is farther away; finally, the movements so run together that it [the fetus or offspring] does not resemble any of its own or kindred, rather all that is left is what is common, and it is [simply] human" (IV 3 768^{b}5–12). What we are to do, then, is to consider an entirely imaginary case of dog coming to be from horse. And the reason to do so is to distinguish the genus animal (common to dog and horse) from its various species (dog, horse) in a vivid way: for in nature there is no such thing as merely being an animal, but only being an animal of a certain species. At a certain stage in the embryological development of our imaginary dog it is already animal, due to the relevant movements in the male progenitor's seed having already been transferred to the female menses. Subsequently, it becomes an animal of a certain sort, but it does not do so from animal insofar as it is animal, since it is already that—hence, "that belongs already" at I 7 191^{b}22–23. After all, if it were to become an animal of a certain sort from animal insofar as it is animal, it would surely become a horse. That it becomes a dog shows that it is not from (the genus) animal that its being a dog derives. By parity of reasoning it is not from (the "genus") what is (= being) or from (the "genus") what is not (= not being) that a certain sort of thing that is (= a certain sort of being) comes to be.

Note 130
We have said what "from what is not" signifies: At I 8 191^{b}9–10.

Note 131
With respect to a capacity or with respect to an activity: I 2 186^{a}3n.

Note 132
This has been discussed with more exactness elsewhere: See *Met.* IX 6 1048^{a}35–^{b}9 (quoted in I 7 191^{a}8n), V 7 1017^{a}35–^{b}9. In XII 2 1069^{b}15–20 the solution is given: "But since being is twofold, everything changes from what is potentially to what is actively—for example, from what is potentially white to what is actively white, and similarly in the case of increase and decrease. So not only is it coincidentally possible for something to come to be from what is not, but in fact for all

things to come to be from what is—from what is *potentially*, however, but from what *actually* is not.”

Note 133

If they had apprehended this nature: That is, the underlying nature or subject mentioned at I 7 191^{a}8.

Note 134

Other thinkers: I 9 192^{a}6–8 makes it clear that these are Platonists.

Note 135

They agree unconditionally that a thing comes to be from what is not, and that on this point Parmenides spoke correctly: They agreed to Parmenides’ dilemma that things either come to be from what is or from what is not, but instead of concluding with him that coming to be is therefore impossible, they took the other horn of the dilemma: it comes to be from what is not.

Note 136

The matter is even close (*eggus*) to being—in a way is—substance: “If you take the extremes, matter is not any other thing beyond itself, and the substance is nothing other than the account [= the form], but the intermediates [= matter-form compounds] are related to each in proportion to their closeness (*eggus*) to it” (*Mete.* IV 12 390^{a}4–7). Thus the matter that is unformed or least formed is not substance, but the proximate or maximally formed matter, which is “a this something in appearance” (*Met.* XII 3 1070^{a}9–10), is in a way substance, since it is potentially what the matter-form compound is actively or actually (VIII 2 1042^{b}9–11, 6 1045^{a}23–24). See also VII 3 1029^{a}2, 10 1035^{a}2, VIII 1 1042^{a}33, 2 1043^{a}27.

The lack is in no way substance: Reading τὴν δὲ στέρησιν οὐδαμῶς with P for OCT τὴν δὲ οὐδαμῶς.

Note 137

The other thinkers, by contrast, identify the great and the small alike with what is not, whether taken together or separately: See I 4 187^{a}17–18n.

Note 138

Their three things: The great, the small (= matter), and the one (I 4 187^{a}17–18).

And ours: Form, lack of form, underlying nature or subject (= matter).

Note 139

He overlooks the other nature (*tên heteran*): That is, the lack (*hê sterêsis*).

Note 140

The nature that remains: That is, the underlying material nature.

The shape: That is, the form.

Just as a mother is: “So far as things formed by nature or by human craft are concerned, the formation of what is potentially is brought about by that which is actually” (*GA* II 1 734^{a}29–31); “The male provides both the form and the source of movement while the female provides the body, that is, the matter” (I 20 729^{a}9–11).

The other part of the contrariety: That is, the lack (of form).

Might often appear, if thought is focusing intensely on its production of bad effects (*kakopoion*), not to be at all: The bad effects are mostly visible in cases of passing away, destruction, and death, which may be attributed to a sort of not being, namely, the not being present of form: "the same thing can be the cause of contraries, since the thing that, when present, is cause of so-and-so, we sometimes hold causally responsible, when absent, for the contrary result—for example, the cause of a shipwreck is the absence of the captain whose presence was a cause of its preservation" (*Met.* V 2 1013^{b}11–15).

Note 141

We say that there is one thing that is divine, good, and sought after: That is, form.

And a second that is contrary to the first: The lack (of form).

And a third: The underlying material nature.

Whereas it follows on their view that the contrary strives for its own destruction: Because they do not distinguish between the matter and the privation, they make the material nature strive for its own contrary—its own destruction. For Plato, as Aristotle interprets him, made the great and the small (= matter) the cause of what is bad, and the one the cause of what is good (*Met.* I 6 988^{a}14–15), so that "the great and small, is the bad-itself," with the result that "all beings participate in the bad except one, namely, the one-itself, . . . and that the bad is the place of the good, and that it participates in and desires what is destructive of it. For contrary is destructive of contrary. And if, as we were saying, the matter is what is potentially a given thing (for example, the matter of what is actively fire is what is potentially fire), then the bad will itself be the potentially good" (XIV 4 1091^{b}33–1092^{a}5).

Note 142

Female yearns for male . . . —except . . . not the intrinsically female, but the coincidentally so: A mature female animal is intrinsically female, so the example cannot refer, as one might think, to her natural yearning for sexual intercourse with a male. The idea seems to stem instead from two elements in Aristotle's own embryology. (1) The first is that being female is "like a natural disability (*anapêrian phusikên*)" (IV 6 775^{a}15–16), affecting in particular the ability to reproduce: "The female exists in virtue of a particular incapacity, in being unable to concoct seed out of the nutriment in its last stage (which is either blood or the analogous part in the bloodless animals) owing to the coldness of her nature" (*GA* I 20 728^{a}18–21). As a result, a female is a source only of matter for her offspring, whereas the male is a source of form (I 8 191^{b}20n). (2) The second is that male and female are "attributes that do properly belong to the animal, not in virtue of its substance [that is, intrinsically] but in the matter—that is, the body. That is why the same seed becomes female or male when it is affected in regard to a certain attribute" (*Met.* X 9 1058^{b}21–24). What is coincidentally female, then, is the material element in reproduction (the menses or female seed), and what it "yearns for" in yearning for male is the formal element.

Ugly (*aischron*) yearns for beautiful (*kalon*)—except not the intrinsically ugly, but the coincidentally so: "The chief kinds (*eidos*) of the beautiful are order (*taxis*), proportion (*summetria*), and definiteness (*hôrismenon*)" (*Met.* XIII 3 1078^{b}1). Since order, proportion, and definiteness are formal elements, this too is a case of matter (some underlying subject that is coincidentally ugly) yearning for form (beauty).

Note 143
As *that in which*, the matter does intrinsically pass away, since what passes away—the lack—is present in it: "By matter I mean that which, intrinsically, is neither said to be a something, nor a quantity, nor anything else by which being is given definition" (*Met.* VII 3 1029^{a}20–21). Thus when this matter, in which the lack is present as an intrinsic attribute, comes to be formed, it does intrinsically pass away.
But as what is potentially, it does not intrinsically pass away, but must be incapable of passing away and coming to be: The matter is potentially formed when it lacks form, and potentially lacks form when it is formed, so it does not come to be or pass away, when it changes from lacking form to being formed, or vice versa.

Note 144
Primary philosophy: See Introduction, pp. xxi–xxii, also I 2 185^{a}20n.
It may be set aside till the appropriate time comes for that: Namely, in *Met.* VII–IX and XII.

Note 145
The expositions (*deiknumenois*) **that follow:** The remaining treatises of natural science or "secondary philosophy" (*Met.* VII 11 1037^{a}15), namely, the rest of the *Physics*, *De Caelo*, *On Coming to Be and Passing Away* (especially Book II), *Meteorology*, and *De Anima*.

Book II

Note 146
Increase (*auxêsis*) **and decrease** (*phthisis*): Or, "growth and withering."

Note 147
Craft (*technê*): A craft is a science concerned with production rather than action or contemplation. See *Met.* VII 7 1032^{a}26–1032^{b}31, *NE* VI 4.
Innate impulse (*hormên*) **to change:** The claim that "a human is by nature a political animal" (*Pol.* I 2 1253^{a}2–3) means, in part, that "an impulse toward this sort of community exists by nature in everyone" (2 1253^{a}29–30)—nature and impulse (*hormê*) are again associated at *Met.* V 23 1023^{a}9: "in accord with the possessor's own nature or in accord with its own impulse." So presumably the impulse to change may exist simply as a sort of conatus, which, in the right circumstances, will result in change.

Note 148
Nature is a sort of starting-point and cause of moving and being at rest in that to which it belongs primarily and intrinsically: Having internal angles equal

to two right angles belongs intrinsically to triangles, since it follows from their essence. So it also belongs intrinsically to isosceles triangles, since they are triangles. But it does not belong primarily (or immediately) to them, since it belongs to them because they are triangles, not because they are isosceles triangles.

Note 149

In some cases (such as a house and each of the other products of handicraft) the starting-point is in something else and external: "From craft come to be the things whose form is in the soul. And by form I mean the essence of each thing and the primary substance" (*Met.* VII 7 1032^{a}33–^{b}1); "Nothing comes away from the carpenter to the matter of the timbers, nor is there any part of the craft of carpentry in the product, but the shape and the form are produced from the carpenter through the movement in the matter. And his soul, in which the form is and his scientific knowledge, moves his hands or some other part in a movement of a particular sort, different when the product is different, the same when it is the same, and the hands move the instruments, and the instruments move the matter" (*GA* I 22 730^{b}11–19).

The starting-point is in the thing but not intrinsically: As in the case of the doctor who cures himself.

Note 150

Substance (*ousia*): See I 2 185^{a}23n.

Note 151

For such people: That is, people who deny that anything is in accord with or by nature or that anything has an internal starting-point of change or rest.

It is necessary for the argument to be about [mere] names: "Since it is not possible to bring the things at issue themselves into dialectical arguments, but we use names as symbols for things, we think that what happens in the case of the names happens in the case of the things at issue as well, just as in the case of pebbles by those doing rational calculations. But the two are not similar. For names and the number of accounts are limited, whereas things at issue are unlimited in number. It is necessary, then, for the same account and for one name to signify several things. Just, then, as in the case of calculation those who are not clever at manipulating the pebbles are cheated by those with scientific knowledge, in the same way in arguments too those inexperienced in the capacity of names argue paralogistically both with themselves and when listening to others" (*SE* 1 165^{a}6–17).

[By which] to understand nothing: "All these [special] sciences mark off a certain being, a certain genus, and busy themselves with it . . . and do not produce any account of the what-it-is. Instead, starting from the what-it-is—some making it clear by means of the perceptual capacities, some getting hold of it as a hypothesis—they in this way proceed to demonstrate the things that belong intrinsically to the genus with which they are concerned, either in a more necessary or in a weaker way" (*Met.* VI 1 1025^{b}7–13). Thus the natural sciences as a whole deal with things that have natures, or are by or in accord with nature, and so are involved in movement. One of their starting-points, therefore, is that there is such a (higher-order) genus as that of the natural beings. As a scientific starting-point this is grasped by understanding on the basis of perception and induction (I 1 184^{a}10n(5)). If someone demands to have it too demonstrated, it is clear that he is inadequately educated in science and its philosophy: "It is lack of educatedness not to know what things we should look for a demonstration of and what things we should not. For it is in general impossible to demonstrate everything (for it would go on without limit, so that even then there would be no demonstration)" (*Met.* IV 4 1006^{a}6–9). Like the congenitally born person in the case of colors, then, his demonstrations in natural science must consist in empty names, since the perception-based experience that alone would give them empirical content is ruled out of court. See also I 2 184^{b}25–185^{a}14.

Understand (*noein*): In the broadest sense of the term, someone with *nous* ("understanding") is someone with sound common sense, and the cognate verb *noein*, like *dianoeisthai*, means "to think" (IV 1 208^{b}25, *Mete.* I 3 340^{b}14, *NE* III 1 1110^{a}11). *Nous*, in this sense, is what enables a soul to suppose, believe, deduce, calculate, reason, and believe, so that it is possible to *noein* something false (*DA* III 3 427^{b}9). In the narrow sense, which is the one relevant here, *nous* is what makes possible a type of knowledge of universal scientific starting-points that, unlike scientific knowledge proper, is not demonstrable from anything further: "About the starting-point of what is scientifically known there cannot be scientific knowledge . . . since what is scientifically known is demonstrable . . . the remaining alternative is for *nous* to be of starting-points" (*NE* VI 6 1140^{b}33–1141^{a}8); "*nous* is of the terms or definitions [or terms] (*horoi*) for which there is no reason [or argument] (*logos*)" (8 1142^{a}25–26).

This *nous* is a divine substance (*NE* I 6 1096^{a}24–25, X 7 1177^{b}19–1178^{a}8), or anyway the most divine one in human beings (X 7 1177^{a}16), and so it shares in the immortality that is characteristic of gods: "it alone [of the parts of the human soul] is immortal and eternal" (*DA* III 5 430^{a}23). Consequently, it alone of these parts is separable from the human body and can survive its death: "*Ho nous* seems to be born in us as a sort of substance, and not to pass away . . . understanding (*noein*) and contemplating (*theôrein*) are extinguished because something else within passes away, but it itself is unaffected" (I 4 408^{b}18–25; also *Long.* 2 465^{a}26–32). Among sublunary animals this *nous* is fully possessed only by human beings (*PA* II 10 656^{a}7–8, *NE* X 8 1178^{b}24–25). In fact, a human being is most of all his *nous* (IX 8 1168^{b}31–32, X 7 1178^{a}2–8).

Although classified in these texts as a substance, *nous* is also sometimes classified as a state (*hexis*) of the soul that "grasps the truth by way of affirmation and denial" (*NE* VI 3 1139^{b}15–17). For in its case the distinction between a state and its activation collapses, since it is "in substance [or essence] and activity" (*DA* III 5 430^{a}18), though it must be in touch with an intelligible object in order to grasp the truth about it (*Met.* XII 7 1072^{b}18–30).

No English term is a precise equivalent for *nous* or *noein* in this narrow sense. "Intellect," which is in many ways the best choice, lacks a cognate verb in current use. "Understanding" is better in this respect but shares with "intellect," "intelligence," "intuitive reason," "apprehension," and other common translations the defect of not being factive or truth entailing, since *nous* is one of the five states of the soul “in which the soul grasps the truth by way of affirmation and denial” (*NE* VI 3 1139^{b}15–17).

Note 152

Nature is the first component present in it, which is intrinsically unshaped (*arruthmiston*): Compare: “That from which some one of the beings that are by nature first is or comes to be, and which is unshaped and cannot be changed from the capacity that belongs to it, is said to be its nature—for example, bronze is said to be the nature of a statue and of bronze artifacts, wood of wooden ones, and similarly in the case of others” (*Met.* V 4 1014^{b}26–31).

The wood is the nature of the bed, and the bronze of the statue: The statue and the bed are not as such natural beings, but rather artifacts. But insofar as they are made of natural things, wood and bronze, they have a (material) nature.

Note 153

Something that is not separable except in account: That is, not separable from movement and perceptible matter. See II 2 193^{b}31–194^{a}7 and, on separability more generally, I 2 185^{a}31n.

Note 154

If this is therefore craft, the shape too is nature: human does indeed (*ge*) **come to be from human:** Reading εἰ δ’ ἄρα τοῦτο τέχνη, καὶ ἡ μορφὴ φύσις· γίγνεται γ’ ἐξ ἀνθρώπου ἄνθρωπος with P and the mss. for OCT εἰ δ’ ἄρα τοῦτο φύσις, καὶ ἡ μορφὴ φύσις· γίγνεται γὰρ ἐξ ἀνθρώπου ἄνθρωπος (“but if this is therefore nature, the shape too is nature. For human comes to be from human”). The idea, admittedly obscurely expressed on either reading, is this: The fact that wood, not a bed, comes from a planted bed shows that the matter (wood) is its nature, not the shape. But if the bed is, therefore, [an example of craft], then the shape is nature too, because as wood comes from wood (bed)—remember—human does come to be from human.

Note 155

We speak of nature as coming to be: “What is said to be nature (*phusis*) is in one way, the coming to be of things that grow (*phuomenôn*), as if we were to pronounce the *u* long” (*Met.* V 4 1014^{b}16–17). *Phuesthai* (“to grow”) has a long *u* in most of its forms, Aristotle is citing this fact to draw a (dubious?) etymological connection between it and *phusis*. See also Plato, *Lg.* 892c.

Note 156

We must investigate later: See V 1 and *GC* I 3.

Note 157

If it belongs to the natural scientist to know what the sun or the moon is, for him not to know their intrinsic coincidents (*tôn kath’ hauta sumbebêkotôn*) **would be absurd:** The *kath’ hauta sumbebêkota* belong to a subject intrinsically and thus demonstrably, but are not part of its *ousia*, or essence, or what-it-is (1 2 185^{b}1n). Scientific knowledge, however, is of what is demonstrable from essences or what-it-ises (I 1 184^{a}10n). That is why it would be absurd for a natural *scientist* to know the latter, but not to know the intrinsic coincidents that follow demonstrably from them.

Note 158
Those who speak about the Ideas: Namely, Plato and the Platonists.

Note 159
For odd and even, straight and curved, and furthermore number, line, and figure will be without movement, whereas flesh, bone, and human will not, but rather all of them are said of things just as snub nose is and not as curved is: Compare *Met.* VI 1 1025^{b}28–1026^{a}6. Compare *Met.* VI 1 1025^{b}28–1026^{a}6: "But we must not neglect to consider the way the essence or its account is, because, without this, inquiry produces no result. Of things defined, however, that is, of the 'whats' that things are, some are the way the snub is, others the way the concave is. And these differ because the snub is grasped in combination with the matter (for the snub is a concave nose), whereas the concavity is without perceptible matter. If, then, all natural things are said the way the snub is (for example, nose, eye, face, flesh, bone, and, in general, animal, and leaf, root, bark, and, in general, plant—for the account of none of these is without [reference to] movement, but always includes matter), the way we must inquire into and define the what-it-is in the case of natural things is clear, as is why it belongs to the natural scientist to get a theoretical grasp even on some of the soul, that is, on as much of it as is not without matter."

Note 160
It was only very slightly that Empedocles and Democritus touched on form and essence: "Early philosophy concerning all things seemed to speak inarticulately, because it was young and at the starting-point, since even Empedocles says that bone exists as a result of its ratio, and this is the essence and the substance of the thing" (*Met.* I 10 993^{a}15–18); "Democritus touched first on this [namely, essence, and defining the substance], not in the supposition that it was necessary for the theoretical knowledge of nature, but because he was brought to it by the thing itself" (*PA* I 2 642^{a}26–28).

Note 161
Knowledge of the for-the-sake-of-which (*to hou heneka*)**—that is, the end—belongs to the same science as knowledge of the things that are for its sake:** The science that deals with an end also deals with the means to that end. Nature as form is end, while nature as matter is means to it. For the form of a natural being is inseparable from the matter needed to realize it. So natural science should deal both with matter and with form.

Note 162
Nature is an end and a for-the-sake-of-which: "What each thing is when its coming to be has been completed, this we say is the nature of each—for example, of a human, of a horse, or of a household. Further, its for-the-sake-of-which—namely, its end—is best, and self-sufficiency is both end and best" (*Pol.* I 2 1252^{b}32–1253^{a}1).

For whenever a continuous movement has a certain end of its movement, this is a last thing and the for-the-sake-of-which: Reading ὧν γὰρ συνεχοῦς τῆς κινήσεως οὔσης ἔστι τι τέλος τῆς κινήσεως, τοῦτο ἔσχατον καὶ τὸ οὗ ἕνεκα with P and most mss. for OCT ὧν γὰρ συνεχοῦς τῆς κινήσεως οὔσης ἔστι τι τέλος, τοῦτο <τὸ> ἔσχατον καὶ τὸ οὗ ἕνεκα.
A continuous movement: See VIII 8 261^{b}36–262^{a}5.
This is a last thing and the for-the-sake-of-which: "The end—that is, the for-the-sake-of-which—is a last thing" (*Met.* V 16 1021^{b}29–30).

Note 163

The poet spoke ridiculously when he said, "he has reached the end for which he was born": That is, when he said this of someone who had died, since this would imply that the end (in the sense of the goal) for which we are born is to die.
The poet: An unidentified comic dramatist, Kock, p. 493.
By "end" we mean not every last thing, but the best one: "The end is the best and last thing for whose sake all the other things are done" (*EE* II 1 1219^{a}10–11).

Note 164

Good relative to the function (*euergon*): See II 2 194^{b}5–8.
Function (*ergon*): A function is (1) an activity that is the use or actualization of a state, capacity, or disposition; (2) a work or product that is the further result of such an activity (*NE* I 1 1094^{a}5–6). It is intimately related to its possessor's end or final cause: "The function is the end, and the activity is the function" (*Met.* VIII 8 1050^{a}21–22); "each thing of which there is a function is for the sake of its function" (*Cael.* II 3 286^{a}8–9). Moreover, a thing's good or doing well "seems to lie in its function" (*NE* I 7 1097^{b}26–27). But this holds only when the thing itself is not already something bad (*Met.* VIII 9 1051^{a}15–16). Finally, a thing's function is intimately related to its nature, form, and essence. For a thing's nature is "its for-the-sake-of-which" (*Ph.* II 2 194^{a}27–28), its form is more its nature than its matter (1 193^{b}6–7), and its essence and form are the same (*Met.* VII 7 1032^{b}1–2). Hence "all things are defined by their function" (*Mete.* IV 12 390^{a}10), with the result that if something cannot function, it has no more than a name in common with its functional self (*Met.* VII 10 1035^{b}14–25, *Pol.* I 2 1253^{a}20–25, *PA* I 1 640^{b}33–641^{a}6). Functions are thus attributed to a wide variety of things, whether living or non-living. These include plants (*GA* I 23 731^{a}24–26) and animals generally (*NE* X 5 1176^{a}3–5), including divine celestial ones (*Cael.* II 3 286^{a}8–11), parts of their bodies and souls (*PA* II 7 652^{b}6–14, IV 10 686^{a}26–29), instruments or tools of various sorts (*EE* VII 10 1242^{a}15–19), crafts, sciences (II 1 1219^{a}17), philosophies (*Met.* VII 11 1037^{a}15) and their practitioners (*NE* VI 7 1141^{b}10), cities (*Pol.* VII 4 1326^{a}13–14), and nature itself (I 10 1258^{a}35).

Note 165

We make use of all things as if they were there for us: "Property of this sort [namely, food], then, is evidently given by nature itself to all living things straight from when they are first conceived, and similarly too when they have reached completion. And in fact some animals produce at the start, together with their offspring, enough food to last the latter until such time as it is able to get it for itself—for example, those that produce grubs or eggs. Animals that give birth to live offspring, on the other hand, carry food for their offspring in their own bodies for a certain period—namely, the natural substance called milk. It is clear, then, in the case of developed things too, that we must suppose both that plants are for the sake of animals, and that the other animals are for the sake of humans, domestic ones both for using and eating, and if not all, nonetheless most, wild ones for food and other sorts of support, so that clothes and other instruments may be got from them. If then nature makes nothing incomplete and nothing pointlessly, it must be that nature made all of them for the sake of humans" (*Pol.* I 8 1256^{b}7–22). This need not mean, however, that plants and animals have intrinsic natures that are adapted to human uses and purposes; the direction of adaptation may be the other way around: human beings may have the nature they do—including their capacity to develop crafts, sciences, and political communities—because it enables them to use all that nature produces. Thus camels have the sorts of tongues and stomachs they do so that they can eat the thorny bushes that grow in their desert habitats, but these bushes do not have the nature they do because there are camels around to eat them (*PA* III 14 674^{a}28–^{b}18). It is "differences in food have produced different ways of life among the animals" (*Pol.* I 8 1256^{a}21–22), not the other way around (see also IV 4 1290^{b}25–37).

Since we also are in a way an end: (1) "If, then, there is some end (*telos*) of things doable in action that we wish for because of itself, and the others because of it, and we do not choose everything because of something else (since if *that* is the case, it will go on without limit so that the desire will be empty and vain), it is clear that this will be the good—that is, the best good" (*NE* I 2 1094^{a}18–22). (2) "Happiness is the best good" (I 7 1097^{b}22). (3) "What is unconditionally complete, then, is what is always intrinsically choiceworthy and never choiceworthy because of something else. Happiness seems to be most like this, since *it* we always choose because of itself and never because of something else" (1097^{a}33–^{b}1). (4) "Of the other animals, none is happy, since they in no way share in contemplation. Happiness extends indeed just as far as contemplation does, and those to whom it more belongs to contemplate, it also more belongs to be happy, not coincidentally but, rather, in accord with contemplation, since this is intrinsically estimable. And so happiness will be some sort of contemplation" (X 8 1178^{b}27–32). It is these four views, it seems, that make human beings an end in a way that other natural beings are not. A point made from a different direction at *Pol.* I 5 1254^{b}10–13: "Domestic animals are by nature better than wild ones, and it is better for all of them to be ruled by human beings, since in this way they secure their preservation."

Note 166

The end is twofold: "The for-the-sake-of-which is twofold—the purpose for which and the beneficiary for whom" (*DA* II 4 415^{b}2–3).

As we said in *On Philosophy*: This work survives only in fragments. See F1–27 R^3 = Barnes, pp. 2389–2397.

Note 167

The architectonic one (*architektonikê*): Aristotle distinguishes between craftsmen of different degrees of virtue or excellence: (1) The lyre player and the good lyre player have the same function, but the latter has "the superior achievement that is in accord with the virtue (for it is characteristic of a lyre player to play the lyre and to a good one to do so well)" (*NE* I 7 1098^{a}8–12). (2) Some craftsmen know all that is in the craft handbook, so to speak, but when it comes to problems that lie outside it, and so require deliberation, they sometimes arrive at reasons that are false (VI 5 1140^{a}28–30). These people know all the true handbook reasons but not the true deliberative ones. They may be good craftsmen for routine jobs, but, lacking the relevant sort of practical wisdom, they are not good for hard cases. (3) Some craftsmen are wise (*sophos*) in that they are the most exact practitioners of their craft (7 1140^{b}9–10). They know not just the true handbook and deliberative reasons but the ultimate explanatory ones—those that might be found in the most rigorous treatises on the craft's starting-points. Thus what distinguishes "those doctors who pursue their craft in a more philosophical or wisdom-loving way" is that their search for the "primary starting-points of health and disease" leads them to begin by considering nature in general (*Sens.* 1 436^{a}17–^{b}1; also *Juv.* 21 480^{b}22–30). This third class is that of the architectonic craftsmen: "It is also because of this that we consider the architectonic practitioners in each craft to be more estimable, to know in a yet more full sense, and to be wiser than the handicraftsmen, because they know the causes of the things they produce. The handicraftsmen, by contrast, we consider to be like some sort of inanimate things that produce without knowing what they produce, in the way, for example, that fire burns. But whereas inanimate things produce each result by a sort of nature, the handicraftsmen do so by habit—the supposition being that architectonic craftsmen are wiser not in terms of being practically efficient, but in terms of having the account themselves and knowing the causes" (*Met.* I 1 981^{a}30–^{b}6). Thus among the practical and productive sciences "politics seems to be the most architectonic science, since it is the one that prescribes which of the sciences need to exist in cities and which ones each class in cities should learn and up to what point. Indeed, we see that even the capacities that are generally most honored are under it—for example, generalship, household management, and rhetoric. And . . . it uses the other practical sciences and, furthermore, legislates about what must be done and what avoided" (*NE* I 2 1094^{a}26–^{b}6). Hence, "we say that the ones who above all do actions, even external actions, in a controlling way are their architectonic craftsmen who do them by means of their thoughts" (*Pol.* VII 3 1325^{b}22–23).

Note 168

Although the architectonic one as productive knows the matter: Reading ἡ ἀρχιτεκτονική ἡ ὡς ποιητική with P for OCT ἡ ἀρχιτεκτονική, ἡ δὲ ὡς ποιητική.

Note 169

In the case of the products of craft, then, we produce the matter for the sake of the function, whereas with natural things the matter is already present: The implication being that whereas there are two crafts that are concerned with the matter of artifacts, there is only one in the case of natural things.

Note 170

There is one [sort of] matter for one form, and another for another: See II 9 200^{a}30–^{b}7. And so to know about what matter is appropriate, we have to know about the related form.

Note 171

Or just as the doctor knows sinews and the blacksmith bronze, is it in fact up to the point of knowing what each of them is for the sake of . . . ?: Reading ἰατρὸν νεῦρον καὶ χαλκέα χαλκόν and retaining γὰρ with P.

Note 172

Human is begotten by human and sun: "The cause of a human is both his elements, fire and earth as matter and the special form [as form], and furthermore some other external thing, such as the father, and beyond these the sun and its movement in an inclined circle, which are not matter, form, or lack, and are not the same in form [as father or son], but are, rather, movers" (*Met.* XII 5 1071^{a}13–17). The idea is that the reproductive cycles of humans and other animals depend on the seasons, which in turn depend on the sun: "Since we have posited and shown that things are subject to continuous coming to be and passing away, and since we say that spatial movement is the cause of coming to be, it is evident that if the spatial movement is one, it will not be possible for both processes to occur, because they are contraries. For what is the same, and remains in the same state, by its nature produces the same thing, so that either coming to be or passing away will always occur. And so the spatial movements must be more than one and must be contraries, either because of the direction of their movement or because of its irregularity, since contraries have contraries as their causes. That is why it is not the sun's primary spatial movement that is the cause of coming to be and passing away, but that in the inclined circle. For in this there is both continuity and being moved in two movements. For if coming to be and passing away are always to be continuous there must on the one hand be something that is being moved, so that these changes do not fail, and on the other hand two movements, in order that not only one of the two processes will occur. The spatial movement of the whole [that is, the primary heaven—the ethereal sphere of the fixed stars], then, is the cause of the continuity, whereas the inclination is the cause of the approach and retreat. For this results in its becoming further away at one time and closer at another, and since the distance is unequal the movement will be irregular. So, if it causes coming to be by approaching and being close, this same thing causes passing away by retreating and becoming further away; and if it causes coming to be by repeatedly approaching, it also causes passing away by repeatedly retreating. For contraries have contraries as their causes, and natural passing away and coming to be occur in equal intervals of time. That is what the times—that is, the lives—of each sort of thing has a number that determines it" (*GC* II 10 336^{a}23–^{b}12).

Note 173

The way the separable is: See II 2 194^{a}3–7n.
Primary philosophy: See Introduction, pp. xx–xxii.

Note 174
194^{b}23–195^{b}21: *Met.* V 2.

Note 175
The kinds (*genos*) **of these:** Metal in the case of bronze and silver.

Note 176
Some are instruments (*organa*) **and others works:** Drugs are instruments; making thin and purging are works or actions.
Works (*erga*): *Ergon* is usually "function," but here is the work done as further end or result of exercising a function.

Note 177
Not in accord with its being another thing: Equivalent in meaning to "not in a coincidental way." Even when we are talking about a statue insofar as it is a statue, or insofar as it is what it intrinsically is, and not as the possessor of some coincident (such as being in a museum), it still has many causes.

Note 178
Four most evident ways [of being causes] (*tropous*): See *tropoi de tôn aitiôn* at *Met.* V 2 1013^{b}29 and *tous tropus tôn aitiôn* at III 2 996^{b}5–6. On the four ways themselves, see I 3 983^{a}24–32, *APo.* II 11.

Note 179
Phonetic elements (*stoicheia*) **are causes of syllables:** Phonetic elements in spoken syllables ≈ letters in written ones.
Hypotheses: Hypotheses here are premises, which need not be hypothetical in status. See also *Met.* V 1 1013^{a}16.

Note 180
The whole (*to holon*), **the mode of composition** (*hê sunthesis*), **and the form:** "The whole is the form that is over the parts, which function as matter, and the mode of composition over the letters, for the syllable [has a form] of this sort" (Alex. *In. Metaph.* 351.32–33).

Note 181
Let us assume that it makes no difference whether we say "good" or "apparently good": "The [primary] object of appetite is the apparent noble (*kalon*), and the primary object of wish is the really noble (*to on kalon*)" (*Met.* XII 6 1072^{a}27–28); "Should we say that unconditionally and in truth the object of wish is the good, but to each person it is the apparent good? To an excellent person, it is what is truly the proper [= primary] object; to a base one, it is whatever random thing it happens to be. . . . In the case of ordinary people, however, deception seems to come about because of pleasure, which appears to be a good thing when it is not. So they choose what is pleasant as good and avoid what is painful as bad" (*NE* III 4 1113^{a}23–^{b}2); "Appetite is concerned with what is pleasant and what is painful" (2 1111^{b}16–17). As we see from these texts, Aristotle often speaks of the good rather than the noble in making this point. His reason is given at *Met.* XIII 3 1078^{a}31–32.

Note 182

Polyclitus: Active c. 460–410 BC and admired by Socrates (Xenophon, *Memorabilia* I iv 3) and by Aristotle (*NE* VI 7 1141^a10–11) for his wisdom. He advocated a system of proportion in which every part of the body was related mathematically to every other.

Note 183

If the pale and the musical were said to be causes of the statue: The pale and the musical are coincidents of the proper or intrinsic cause, which is Polyclitus or a human.

Note 184

Beyond all the things said to be causes: Reading παρὰ ("beyond"); OCT secludes.

Note 185

The things that causes are causes of will also be said to be in the ways mentioned—for example, . . . this bronze, bronze, or in general matter: See *Ph.* II 2 194^a33–$^b7$.

Note 186

What is actual and what is particular (*ta kath' hekaston*) **exists, or does not exist, at the same time as the things it causes:** At the same time as doctor X is actually or actively making patient Y healthy, or builder Z is actually or actively building house W, Y is being made healthy and W is being built. If X stops making healthy or Z stops building, Y stops being made healthy and W stops being built.

Note 187

The most precise cause (*to aition to akrotaton*): At *Met.* IV 1 1003^a26–27 the *akrotatai archai* are the highest or ultimate causes sought by primary philosophy. Similarly at *NE* I 4 1095^a16 the *akrotaton tôn praktôn agathôn* is the topmost or best good sought by politics. Here, however, the *aition to akrotaton* seems to be the cause that corresponds most precisely to the effect.

Note 188

Luck (*tuchê*) **and chance** (*automaton*): Unlike luck, which is restricted to the subclass of what results from coincidental efficient causes that are "achievable by action" (6 197^a36–$^b3$) and deliberate choice (*Met.* XI 8 1065^a30–32), chance applies quite generally to the entire class, and so consists of all those things "whose cause is indefinite and that come to be not for the sake of something, and neither always nor for the most part nor in an orderly way" (*Rh.* I 10 1369^a32–34). Things that come to be by chance are sometimes said to come about spontaneously, or to be spontaneously generated.

Note 189

We must investigate, then, in what way luck and chance are included among the causes: See II 6 198^a2–5.

Whether luck or chance are the same or distinct: See II 6 197^a36–$^b37$.

And in general what luck is and what chance is: See II 5.

Note 190

The aforementioned argument (*palaios logos*): The one given at II 4 196^{a}1–7 (compare *palai logoi* at VIII 3 254^{a}16 and *palai logos* at *Pol.* III 11 1282^{a}15). Alternatively: "the old argument," which might be that of Leucippus DK 67 B2 = TEGP 57 F15, or that of Democritus DK 68 A 68 = TEGP 56.

Note 191

"It happened to run in this way then, but often in another way": DK 31 B53 = TEGP 97 F55. Compare *GC* II 6 334^{a}1–8.

Note 192

He says that most of the parts of animal come to be by luck: See DK 97 B57–61 = TEGP 118 F71–121, F75. See also II 8 198^{b}32.

Note 193

Other people: The reference is apparently to Democritus.

This heaven (*touranou toude*): "Let us first say what we say to be *ouranos* and in how many ways. . . . In one way, then, [1] we say that the substance of the outermost circumference of the universe is *ouranos*, or the natural body that is on the last circumference of the universe, since more than anything else it is the last upper region that we usually call *ouranos*, the one in which we say that everything divine also has its seat. In another way, [2] it is the body that is continuous with the outermost circumference of the universe, in which we find the moon, the sun, and some of the stars, since we say that these bodies too are in the *ouranos*. Further, [3] we say that the body that is encompassed by the outermost circumference is *ouranos*, since we are accustomed to say that the whole and the universe (*to holon kai to pan*) is *ouranos*" (*Cael.* I 9 278^{b}9–21). Here *ouranos* refers to [3] this universe of ours, in contrast apparently with the unlimited number of cosmoses or world orders that, according to Democritus (DK 67 A24 = TEGP 49), exist within it.

Note 194

There are others, though, who believe that luck is indeed a cause, but that it is unclear to human thought, as being a divine thing and very mysterious: A reference, perhaps, to Plato, *Lg.* 709b: "In all things god—and together with god, luck, and opportunity—steers all human things."

Note 195

The causes we have distinguished: At II 3 194^{b}23–195^{a}3.

Note 196

Either of what is by necessity and always or of what is for the most part (*hôs epi to polu*): Aristotle associates what holds by necessity with what holds always: "*necessary* and *always* go together (since what is necessary cannot not be)" (*GC* II 11 337^{b}35–36). He associates what holds *hôs epi to polu* with what rarely fails to happen (*Top.* II 6 112^{b}10–11), and attributes its existence to matter: "Nature tends to measure the coming to be and passing away of animals by the regular movements of these bodies [the sun and moon], but nature cannot bring this about rigorously because of the indefiniteness of matter, and because many starting-points exist which impede coming to be and passing away from being according to nature, and often cause things to come about contrary to nature" (*GA* IV 10 778^{a}4–9). Since the "indefiniteness of matter" seems to be a standing condition, while the "many starting-points . . . which impede" are not, we should presumably divide things up as follows. The indefiniteness of matter explains why laws or theorems of natural science hold *hôs epi to polu*, and so have contraries that are rarely true, while impediments explain why what otherwise would occur rarely may occur quite often. All human beings are quadrupeds, and this would remain true even if some freak accident or genetic disorder resulted in all or most human beings having only one leg. Nonetheless, it would still hold *hôs epi to polu*, since even under normal conditions a human offspring may be born with only one leg, simply due to facts about his father's seed (form) and his mother's menses (matter). See also *Met.* VI 2.

Note 197

Deliberate choice (*prohairesis*): A deliberative desire (*bouleutikê orexis*) is one that has deliberation as its "starting-point and cause" (*EE* II 10 1226^{b}19–20) and "deliberate choice is either desiderative understanding or thought-involving desire" (*NE* VI 2 1139^{b}4–5).

Note 198

As has been said: At II 5 196^{b}23–24.

Note 199

The difference between luck and chance will be determined later: At II 6 197^{a}36–^{b}37.

Note 200

This provided that he neither for the most part nor of necessity went: Omitting αὐτῷ with P and most mss.

Note 201

Deliberate choice does not occur without thought: Namely, the kind of thought in which deliberation consists. See II 5 196^{b}18n.

Note 202

Unconditionally (*haplôs*): That is, always.

Note 203

Action (*praxis*): The noun *praxis* (verb: *prattein*) is used in a broad sense to refer to any intentional action, including one performed by a child or wild beast (*NE* III 1 1111^{a}25–26, 2 1111^{b}8–9), and in a narrower one to refer exclusively to what results from deliberation (*bouleusis*) and deliberate choice (*prohairesis*), of which neither wild beasts nor children are capable (I 9 1099^{b}32–1100^{a}5, *EE* II 8 1224^{a}28–29). The narrower sense is the one intended here.

Note 204

Good fortune seems to be the same as happiness or close to it: "In fact because a happy person needs the goods that fortune brings in addition, some people think that good fortune is the same as happiness. But it isn't. For even good fortune is an impediment when it is excessive, and presumably it should no longer by rights be called *good* fortune. For the defining mark of *good* fortune is determined by relation to happiness" (*NE* VII 13 1153^{b}21–25).

Happiness is a sort of action, since it is doing well in action: "Both ordinary people and sophisticated ones say it is 'happiness' and suppose that living well and doing well are the same as being happy" (*NE* I 4 1095^{a}18–20); "Happiness has been pretty much defined as a sort of living well and doing well" (I 8 1098^{b}20–22).

Note 205

They do not have deliberate choice: "Children and other animals share in what is voluntary but not in deliberate choice" (*NE* III 2 1111^{b}8–9), and so have no share in the relevant sort of action (II 6 197^{b}1n).

Note 206

Protarchus: An orator and pupil of Gorgias. See Plato, *Phlb.* 58a.

Note 207

When what it is for the sake of does not come to be, but [only] what was for that thing's sake: Reading ὅταν μὴ γένηται τὸ οὗ ἕνεκα, ἄλλ᾽ ὃ ἐκείνου ἕνεκα with P and Wicksteed & Cornford for OCT ὅταν μὴ γένηται τὸ ἕνεκα ἄλλου ἐκείνου ἕνεκα.

Note 208

If something comes to be contrary to nature, we say that it came to be not by luck but by chance: The reference seems to be to cases of animal spontaneous generation (also *to automaton*): "Some products of craft, however, may come about from chance or from luck, in a way quite similar to the ones found in those that come to be from nature. For sometimes there too some of the same things come to be either from seed or without seed" (*Met.* VII 7 1032^{a}28–32); "Natural things that come to be by chance, like the ones there [in the crafts], are those whose matter can also be moved by itself with the same movement as the seed moves it" (9 1034^{b}4–6). Such generation is against nature for the following reason: "It is the most natural function in those living things that are complete and not disabled or spontaneously generated, to produce another like itself—an animal producing an animal, a plant a plant—in order that they may partake in the eternal and divine insofar as they can. For all desire that, and it is for the sake of it that they do whatever they do by nature. . . . Since, then, they cannot share in what is eternal and divine by continuous existence, because nothing that admits of passing away can persist as the same and numerically one, they share in them insofar as each can, some more and some less. And what persists is not the thing itself but something like itself, not one in number but one in form" (*DA* II 4 415^{a}26–^{b}7).

Note 209

But even this is distinct from chance, since the cause of the latter is external, that of the former internal: The cause of something spontaneously generated, which is a certain set of movements like those produced by an egg, are internal to the thing, whereas the cause of something that comes to be by chance is external to it.

Note 210

However true it may be that chance is the cause of the heaven (*tou ouranou*), **understanding and nature must be prior causes both of many other things and of this universe** (*toude tou pantos*): A reference back, presumably, to II 4 196^{a}24–26, but with a switch in terminology, so that *tou ouranou* here = *tôn kosmôn pantôn* ("all the cosmoses") there, while *toude tou pantos* here = *touranou toude* ("this heaven") there.

Note 211

It is clear, then, that there are causes and that they are as many in number as we stated: At II 3 194^{b}23–195^{a}3.

Note 212

[1]–[4]: "When someone is inquiring into the cause, then, he should—since things are said to be causes in many ways—state all the possible causes. For example, of a human, what is the cause as matter? The menses? What is it as mover? The seed? What is it as the form? The essence. What is it as the for-the-sake-of-which? The end. Perhaps, though, these last two are the same [see II 6 198^{a}25–27]. But it is the closest causes that should be stated. What is the matter? Not fire or earth but the one that is special to the thing in question. Where substances that are natural and that come to be are concerned, then, it is necessary to proceed in this way if we are to proceed correctly—if indeed the causes are these and this many, and it is the causes that we need to know. But in the case of the natural but *eternal* substances another account is needed. For perhaps some have no matter, or not matter of this sort but only matter capable of movement with respect to place. Nor is there matter for those things that are indeed by nature but are not substances, where instead the substance is the underlying subject. For example, what is the cause of an eclipse? What is its matter? In fact, there is none. Instead, the moon is what suffers [the eclipse]. And what is the cause as moving and extinguishing the light? The earth. As for the for-the-sake-of-which, perhaps there is not one. And the cause as form is the account. But this is unclear unless it involves the [moving] cause. For example, what is an eclipse? Lack of light. But if we add 'as a result of the earth coming in between,' then this is the account that involves the cause" (*Met.* VIII 5 1044^{a}32–^{b}15).

Note 213

The what-it-is and the for-the-sake-of-which are one, and the first source of the movement is the same in form as these: "The for the sake of which and the account of the substance (these should be taken as pretty much one thing)" (*GA* I 1 715^{a}4–6). "Pretty much" and "often" rather than "always," because some natural things are not for the sake of anything: "Just as bile, when it comes about throughout the rest of the body, seems to be a residue or colliquescence, so also the bile near the live seems to be a residue and not for the sake of something, as also does the sediment in the stomach and intestines" (*PA* IV 2 677^{a}11–15).

Note 214

There are three sorts of [scientific] works: Theology, which is concerned with the primary god and the other immovable movers of the heavenly spheres; astronomy,

which is concerned with the moving but eternal heavenly bodies; and natural science, which is concerned with things that are capable of passing away. See I 9 $192^{a}35$n.
Works (*pragmateiai*): As at II 3 $194^{b}18$.

Note 215
The why is given by referring back to the matter, the what-it-is, and the first cause of the movement: The final cause, having been identified with the formal one (the what-it-is) at II 7 $198^{a}15$, is omitted.

Note 216
And this cause must be known: That is, the immovable what-it-is or form.
The why given in all ways: Reading πάντως ἀποδοτέον τὸ διὰ τί with P for OCT καὶ πάντως ἀποδοτέον τὸ διὰ τί.

Note 217
[1]–[4]: [1] refers to the efficient cause, or cause of movement; [2] to the material cause; [3] to the formal cause; and [4] to the final cause.

Note 218
And then what way necessity is present in natural things: Taken up in II 9.

Note 219
For if they mention any other cause, they just touch upon it, and let it go at that: The criticism is developed in *Met.* I 4 $985^{a}10$–23, 7 $988^{b}6$–16.
One mentioning love and strife, another the [divine] understanding: Empedocles (love and strife) and Anaxagoras (the understanding).

Note 220
But as Zeus rains down rain (*huei ho Zeus*): An idiomatic way of saying, "it rains." There is no implication that an agent, or his deliberately chosen and teleologically explicable actions, is involved. Otherwise, of course, it might well be that Zeus did rain down rain to make the corn grow.
Not in order that the corn may grow, but of necessity: If, as seems reasonable, this rain is winter rain, whereas the rain mentioned in the next sentence as ruining the corn on the threshing floor is summer rain, then Aristotle will shortly deny that this account of these rains, as not being for the sake of corn growth and preservation, is correct (II 8 $198^{b}32$–$199^{a}8$).

Note 221
The man-headed ox-progeny mentioned by Empedocles: DK 31 B61 = TEGP 121 F75.

Note 222
It does not seem to be by luck or by coincidence that it rains often in winter, but if it does so in the dog days of summer; nor that there are heatwaves in the dog days, but if there are in the winter: "For what is neither always nor for the most part—that is what we say is coincidental. For example, if in the dog days we have storm and cold, we say that it is a coincidence, but not if we have stifling heat,

because the latter occurs always or for the most part, the former not" (*Met.* VI 2 1026^{b}31–35). It follows, it seems, that winter rains (and summer heatwaves) *are* for the sake of something. But this need not mean, to repeat a point made in II 2 194^{a}34–35n, that the natures of the sun and rain are for the sake of corn growth (or corn non-perishing). It may rather be that it is the nature of corn that is adapted to those of the seasons, and the weather that always or for the most part occurs in them.

Note 223

As things are done in action, so they are in nature, and as they are in nature, so each of them is done in action: "Since we have a theoretical grasp on more than one cause of natural coming to be—for example, both on the one for the sake of which and on the one from which comes the starting-point of movement, we also need to determine about these causes which sort is first and which sort second. But it is evident that first is the one we call 'for-the-sake-of-which.' For this is an account of the thing, and the account is a starting-point alike in the things composed in accord with craft and in those composed by nature. For once the doctor has defined health and the builder has defined a house, whether by thought or by perception, they give the accounts and the causes of each of the things they produce, and why they must be produced in this way. Yet the for-the-sake-of-which and the good are present more in the works of nature than in those of craft" (*PA* I 1 639^{b}11–21).

Note 224

This sort of cause: The for-the-sake-of-which or final cause.

Note 225

Monsters (*terata*): Monsters, which are offspring that are not the same in form or species as their progenitors (*GA* IV 3 767^{a}5–7), are produced by the same embryological mechanisms as are presupposed by the imaginary case of a dog coming to be from a horse. See I 8 191^{b}20n.

Note 226

Defining mark (*horos*): A common meaning of the noun *horos*, from which verb *horizesthai* ("define") derives, is "term," in the logical sense, in which a syllogism has three terms. But often a *horos* is a definition or, as here, a defining mark (a boundary marker is a *horos*) that gives definition to what would otherwise lack it (*Pol.* I 9 1258^{a}18, II 8 1267^{a}29, VII 4 1326^{a}35).

Note 227

The "undifferentiated (*oulophues*) **first"**: Empedocles DK 31 B62.4 = TEGP 125.4 F76.

Note 228

A guest-friend (*xenos*): Guest-friendship (*xenikê philia*) was a ritualized form of pseudo-kinship (typically) between men of equal social status but belonging to different social units (such as Athens and Sparta), involving a variety of forms of mutual support, including exchange of valuable resources (gifts, troops) and services (a home away from home, paying a ransom). The relationship, like true kinship, was perpetual, descending from fathers to sons, so that, for example, a *xenos* was expected to show protective concern for the son of his *xenos*, including acting as his substitute father if his real father died.

Note 229

Luck is one of the coincidental causes, as we said previously: At II 5 196^{b}23–27.

Note 230

Craft does not deliberate: An overstatement of a view expressed more cautiously in the following text: "There is no deliberation, however, where sciences that are both exact and self-sufficient are concerned—where writing the letters of the alphabet is concerned, for example, since we have no hesitation about what way to write them. We do deliberate, however, about those things that come about through ourselves, but not always in the same way (for example, about the things that medicine or moneymaking deals with). And we deliberate more about navigation than about athletic training, insofar as navigation is less exactly developed. Further, deliberation is involved in a similar way where the rest are concerned, but more where crafts are concerned than sciences, since we are more hesitant about them" (*NE* III 3 1112^{a}34–^{b}9).

Note 231

The end is itself also a starting-point, although not of action but rather of rational calculation: "Of action, then, the starting-point—the source of the movement, not what it is for the sake of—is deliberate choice, and of deliberate choice, the starting-point is desire and reason that is for the sake of something" (*NE* VI 2 1139^{a}31–33); "In actions the end for which we do them is the starting-point, just as hypotheses are in mathematics" (VII 8 1151^{a}16–17); "In mathematics nothing is shown through this cause [namely, the for-the-sake-of-which], nor is there any demonstration where the cause is this: 'because it is better or worse'" (*Met.* III 3 996^{a}29–31). Aristotle has analogized nature to craft in II 8, so that the thought in our text, elaborated upon in these others, applies primarily to crafts, but as a result illuminates its analogue.

Note 232

In mathematics . . . no actions are involved: Mathematics is a theoretical science, whose aim is truth, whereas action is the focus of practical or action-involving sciences, such as ethics and politics. See I 1 184^{a}10n.

Note 233

Even in the account there are parts that stand as matter of the account: This is because natural things are like snub not like concave (II 2 194^{a}3–7n); "snubness is what is said of things composed of both [a nose and concavity], as *a this in this*" (*Met.* VII 5 1030^{b}17–18), or as "these things in this state" (11 1036^{b}24).

Matter of the account (*hulê tou logou*): "It is clear that the affections of the soul are enmattered accounts (*logoi enuloi*). So their definitions will be of this sort, for example: 'Being angry is a sort of movement of such-and-such a sort of body, or of a part or a capacity, as a result of something for the sake of something.' And this is why it already belongs to the natural scientist to get a theoretical grasp on the soul, either all soul or this sort of soul" (*DA* I 1 403^{a}25–28).

Book III

Note 234

The theoretical knowledge of what is special is posterior to that of what is common: See I 7 189^{b}30–32n, 1 184^{a}23–25n.

Note 235

200^{b}26–28: Compare *Met.* XI 9 1065^{b}5–7.

Some things, then, are [1] actual only, others [2] potential, and [3] others potential and actual—being either a this something, a quantity, a quality, or likewise one of the other categories of being: Reading [1] ἔστι δὴ τὸ μὲν ἐντελεχείᾳ μόνον, [2] τὸ δὲ δυνάμει, [3] τὸ δὲ δυνάμει καὶ ἐντελεχείᾳ (compare *Met.* XI 9 1065^{b}5–7); OCT omits [2]. [1] A substantial form (VIII 8 1050^{b}1–2); [2] includes such things as the unlimited and the void (1048^{b}9–17); [3] matter-form compounds.

Note 236

Of what is relative, one sort is said of things with reference to excess and deficiency, another with reference to affecting or being affected, and in general with reference to what can move something and be moved by something: This is one of four somewhat different accounts of the category of relatives. The other three are as follows: "We call relatives all such things as are said to be just what they are, *of* or *than* other things, or in some other way in relation to something else. For example, what is larger is said to be *than* something else, since it is said to be larger than something, and what is double is said to be *of* something else, since it is said to be double of something. Similarly with all other such cases" (*Cat.* 7 6^{a}36–^{b}2); "Things are said to be relative: [1] As double relative to half and triple relative to one third, and in general multiple relative to submultiple, and what exceeds relative to what is exceeded. [2] As what is capable of heating relative to what is capable of being heated, what is capable of cutting relative to what is capable of being cut, and in general what is capable of acting relative to what is capable of being affected. [3] As the measurable relative to the measure, the scientifically knowable to scientific knowledge, and the perceptible to perception" (*Met.* V 15 1020^{b}26–32); "We have determined elsewhere that things are said to be relatives in two ways, some as contraries, others in the way that scientific knowledge is related to the scientifically knowable, where something is said to be relative because something else is relative to it" (X 6 1056^{b}34–1057^{a}1).

Note 237

200^{b}32–201^{a}19: Compare *Met.* XI 9 1065^{b}7–20.

A this (*tode*): A common abbreviation for *tode ti*, on which see I 7 190^{a}32n.

Note 238

No *being* exists beyond the ones we mentioned either: See I 1 184^{a}10n(7).

Note 239

In one case it is shape, in the other its lack: See I 7 190^{b}20n.
In one case it is white, in the other black: Color is a standard example of a quality. All colors are definable as a ratio of white to black (the lack of white). See I 5 188^{b}24–25n.

Note 240

Spatial movement (*phora*): That is, movement with respect to place.

Note 241

Actually and potentially (*dunamei*): *Dunamei* is also translated as "capable of." See I 2 186^{a}3n.
The actualization of what is potentially, insofar as it is such, is movement: Compare VIII 5 257^{b}8–9.

Note 242

What is capable of increasing and of its opposite decreasing: Reading τοῦ δὲ αὐξητοῦ καὶ τοῦ ἀντικειμένου φθιτοῦ with OCT and mss. Hussey, with some justification, omits τοῦ ἀντικειμένου ("and its opposite") on the grounds that increase and decrease is clearly being treated as one thing.

Note 243

How things stand where this is concerned will become clear from other considerations: See VIII 5.
For there is one mover that is immovable: Reading ἔστι γάρ τι τῶν κινούντων καὶ ἀκίνητον with P and most mss. for OCT ἔστι γάρ τι κινοῦν καὶ ἀκίνητον.

Note 244

201^{a}27–202^{a}3: Compare *Met.* XI 1065^{b}22–1066^{a}26.

Note 245

Being for bronze is not the same as being for a certain potential: See I 2 185^{b}22n.

Note 246

The underlying subject, though, whether it is healthy or diseased, whether it is moisture or blood, *is* one and the same: According to the Hippocratic author of *On Ancient Medicine*, for example, the human body contains a blend (*chrêsis*) of moist substances or humors (*chumoi*), each with a capacity (*dunamis*) to cause a specific effect: "These, when mixed and blended with one another are neither manifest nor cause the human being pain; but when one of them separates off and comes to be on its own, then it is both manifest and causes the human being pain" (14.4 Schiefsky). Plato adopts a somewhat similar view, with imbalances in the blood playing an important role in causing certain diseases (*Ti.* 81e–86a).

Note 247

When the actuality itself does: Reading αὐτή with OCT and P; Hussey reads αὕτη with two mss. ("when the actuality is this actuality").

Note 248
Some say that movement is otherness (*heterotêta*) or inequality (*anisotêta*) or not being: "Let us always posit movement as irregularity (*anômalotêta*). And the cause again of what is irregular in nature is inequality (*anisotês*)" (Plato, *Ti.* 57e7–58^{a}1).

Note 249
The starting-points in one of the two columns of opposites: See I 5 189^{a}1n.
Because they are lacks, are indefinite: See I 7 190^{b}27n.

Note 250
It cannot be posited unconditionally either as a potentiality of beings or as an activation of them: Reading αὐτήν ἁπλῶς with P for OCT αὐτήν.

Note 251
The remaining option is that it must be the way we said: Namely, "both an activity and not an activity" (*Met.* XI 9 1066^{a}25–26).
The sort of activity we stated: At III 1 201^{a}10–11.

Note 252
Everything that moves things in the way we said: That is, everything that "naturally (*phusikôs*) causes movement" (III 1 201^{a}23–25).
For in the case of what movement belongs to, immobility (*akinêsia*) is rest: Rest is thus lack of movement, which can be ascribed only to what can move. See I 7 190^{b}27n.

Note 253
This it does by contact, so it is at the same time affected: True of all contact between bodies, but not of contact between a body and a mind. See VII 1 242^{b}59–63n, VIII 5 258^{a}20–21n.

Note 254
That is why movement is the actualization of the movable insofar as it is movable, and this happens by contact with what is capable of moving it, so that the latter is also affected at the same time: Some editors, including Hussey, delete this sentence.

Note 255
Movement is the actualization of the moveable by what can in fact move something: Reading καὶ with P; OCT secludes.

Note 256
These things are one, but their account is not one: "the being for them is not one" (*Met.* XI 9 1066^{a}33). Compare 202^{b}9.

Note 257
202^{a}13–21: Compare *Met.* XI 9 1066^{a}26–34.

Note 258
A logico-linguistic puzzle (*aporian logikên*): (1) The adjective *logikos* is used to distinguish a set of propositions and problems from those belonging to natural

science or ethics: "Propositions such as this are ethical—for example, whether one should obey our parents or the laws, if they disagree. *Logikos*, whether contraries belong to the same science or not. Natural scientific, whether the cosmos is eternal or not. And similarly for the problems" (*Top.* I 14 105^{b}21–25). Since the question about a science of contraries is a philosophical one (*Met.* III 2 996^{a}18–21), *logikos* problems overlap with philosophical ones. At the same time, "if an argument depends on false but reputable beliefs, it is *logikos*" (*Top.* VIII 12 162^{b}27), suggesting that *logikos* arguments overlap with dialectical ones, since both may rely on reputable beliefs (*endoxa*) or—more-or-less equivalently—on things said (*legomena*) about the topic (*Ph.* I 2 185^{a}2–3n). Indeed, the question about a science of contraries is itself identified as one for dialectic (*Met.* XIII 4 1078^{b}25–27).

(2) When Plato, unlike previous thinkers, is accorded a share of dialectic it is due to his investigation of *logoi* or accounts (*Met.* I 6 987^{b}31–33), which he almost always undertook through staged Socratic conversations, whose aim was to discover the correct definition (XIII 4 1078^{b}23–25) of what something essentially or intrinsically is, or is itself-by-itself (*auto kath' hauto*)—the "itself" in the name of a Form probably stems from its being the ontological correlate of such a definition (*Met.* III 2 997^{b}8–9). One core meaning of *logikos*, in fact, relates it to conversation and speaking, while another relates it to reason—the *logikai aretai* are the virtues of reason or thought (*NE* II 8 1108^{b}9–10). When we ask *logikôs* (adverb) why it is that these bricks and stones are a house, what we are asking for is a formal cause or an essence (*Met.* VII 17 1041^{a}26–28), which is presumably why a deduction of the essence is a *logikos sullogismos* (*APo.* II 8 93^{a}15).

(3) When dialecticians are contrasted with natural scientists it is on the grounds that "the scientist gives the matter, whereas the dialectician gives the form and the account" (*DA* I 1 403^{b}1–2)—again associating dialectic with proceeding *logikôs*. The dialectician proceeds *logikôs*, the natural scientist *phusikôs*—looking to matter but also to form, when the relevant essence requires it (*Met.* VI 1 1026^{a}5–6). So to proceed in a strictly *logikôs* way, when there is empirical evidence bearing on the subject, is bad scientific practice: "It seems that the knowledge of the what-it-is is not only useful for getting a theoretical grasp on the causes of the coincidents connected to the essences [= intrinsic coincidents] . . . but also, conversely, knowing these coincidents contributes in great part to knowing the what-it-is. For when we can give an account of the way either all or most of these coincidents appear to be, we will then be able to speak best about the essence. For the starting-point of all demonstration is [the definition of] the what-it-is, so that insofar as definitions do not lead us to know the coincidents, or fail even to facilitate a likely conjecture about [how to demonstrate] them, it is clear that they have all been stated in a dialectical and empty way" (*DA* I 1 402^{b}16–403^{a}2).

(4) Before we start defining essences *logikôs*, then, we should have intimate knowledge of the empirical data that they are supposed to explain: "What causes our inability to take a comprehensive view of the agreed-upon facts is lack of experience. That is why those who dwell in more intimate association with the facts of nature are better able to lay down starting-points that can bring together a good many of these, whereas those whom many arguments have made unobservant of

the facts come too readily to their conclusions after looking at only a few facts" (*GC* I 2 316^{a}5–10). Thus a frequent criticism of Plato and the Platonists is that in proceeding *logikôs* they leave the earth and the world of facts too far behind and proceed at too abstract and general a level (*Met.* I 2 987^{b}29–988^{a}7, XII 1 1069^{a}26–28).

(5) When the perceptual data are scarce, however, it is still possible to make some scientific headway. Astronomy is a case in point. Our theoretical knowledge of the heavenly bodies is relatively slight, "since as regards both those things on the basis of which one would investigate them and those things about them that we long to know, the perceptual appearances are altogether few" (*PA* I 5 644^{b}25–28). There are many puzzles in astronomy, therefore, about which we can do little but conjecture, since "where things not apparent to perception are concerned, we think we have adequately shown our case to be in accord with reason if we have brought things back to what is possible, given the available appearances" (*Mete.* I 7 344^{a}5–7). To become a "little less puzzled" in areas like these is—until further perceptual data becomes available—the most we can hope for (*Cael.* II 12 291^{b}24–28).

Note 259

The function and end of the first is a thing done (*poiêma*): "[1] The function (*ergon*) is the end (*telos*), and [2] the activity (*energeia*) is the function" (*Met.* IX 8 1050^{a}21–22). In this slight expansion of our text, [2] identifies the function of X not with a dormant capacity but with the activity that is the capacity activated or actualized in active functioning. Thus "the function of a human is activity of the soul in accord with reason or not without reason" (*NE* I 7 1098^{a}7–8). Such active functioning, [1] tells us, repeating standard doctrine (*Met.* III 2 996^{b}7), is X's end. A *poiêma* in the case of poetry is a poem, in the sense of one that is being actively recited; in the case of movement it is a thing done, considered as actively being done. Thus a *poiêma* is the product of a *poiêsis* in the way that a piece of music is the product of a performance of it.

Thing undergone (*pathos*): See I 4 188^{a}6n.

Note 260

Homonymous (*homônumos*): "Things are said to be *homonymous* when they have only a name in common, but the account of the substance [= essence] that corresponds to the name is distinct—for example, both a human and a picture are animals. These have only a name in common and the account of the essence corresponding to the name is distinct. For if we are to say what-it-is for each of them to be an animal, we will give a special account to each" (*Cat.* 1 1^{a}1–6).

Note 261

As was said earlier: At III 3 202^{a}18–20, also 202^{b}9.

Note 262

In the strict sense (*kuriôs*): What is *kurios* is what has executive power or authority or the power to compel, so that a general is *kurios* over his army (*NE* III 8 1116^{a}29–^{b}2) and a political ruler is *kurios* over a city and its inhabitants. Since what is *kurios* in a sphere determines or partly determines what happens within it, it is one of the most estimable or important elements in the sphere, so that what is inferior or less important than something that is not *kurios* there (VI 12 1143^{b}33–35, 13 1145^{a}6–7). The *kurios* meaning of a term is thus its "prevailing" meaning (*Rh.* III 2 1405^{a}1–2). When Aristotle contrasts natural virtue of character with the *kurios* variety (*NE* VI 13 1144^{b}1–32), the control exerted by the latter seems to be teleological: the natural variety is a sort of virtue because it is an early stage in the development of mature virtue. Hence *kuria aretê* is "full virtue" or virtue in the strict sense of the term. It is in this sense, which is the one relevant here, that the life of those who are active and awake is a more *kurios* life—life in a fuller or stricter sense—than that of the inactive or asleep (I 7 1098^{a}5–8).

Note 263

[1] being the activation of *this* occurring in *that* and [2] being the activation of *that* by *this* are distinct in account: [1] is the affecting and [2] the being affected.

Note 264

An affection (*pathos*): "What is said to be an affection [1] in one way is a quality in virtue of which a thing can be altered—for example, white and black, sweet and bitter, heaviness and lightness, and other things of that sort, [2] in another way, the activations of these—the already accomplished alterations. [3] Further, of these, especially alterations and movements that are injurious—above all, painful injuries. [4] Further, large-scale misfortunes and painful experiences are said to be affections" (*Met.* V 21 1022^{b}15–21).

Point (*stigmê*): "Points are cuts or divisions of lines" (*Met.* XI 1060^{b}13–15), which as such have no magnitude, whether limited or unlimited in extent.

Note 265

Separable: See I 2 185^{a}31n.

Note 266

When "gnomons" are arranged around the one and separate (*kai chôris*), the form is always a distinct one in the latter case, and the same in the former: Though the meaning of the passage—especially of *kai chôris*—is disputed, a plausible interpretation is this: The one is both odd and even (*Met.* I 5 986^{a}20). It is represented by •, when odd, and by • and a separate • (that is, by ••), when even. Enclose • with a gnomon, which is like a carpenter's set square (represented by lines). This gives Fig.1 below. Now enclose •• with a gnomon. This gives Fig. 2.

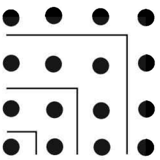


Fig. 1

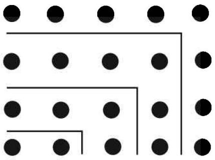


Fig. 2

In Fig. 1 a series of squares (square or even numbers) is generated, in Fig. 2 a series of rectangles (rectangular or odd numbers). The successive square or even numbers (2, 4, 6, 8 . . .) generated from • (the one taken as odd) are all similar (= n^2).

The successive rectangular or odd numbers generated from •• (or the one taken as even) are all dissimilar, since the ratio n:n+1 is different for all values of n. This may be why odd was associated with limit and even with unlimited.

Note 267

Plato has two unlimiteds: See III 6 206^{b}27–33.
Namely, the great and the small: See I 4 187^{a}17n.

Note 268

What is intermediate between these: "Denser than air but more fine-grained than water" (*Met.* I 8 989^{a}14–15). The holder of the view is unknown.

Note 269

***His* universal seedbed (*panspermia*) of shapes:** Aristotle uses an Anaxagorean idea, that of a *panspermia* (DK 59 B4a = TEGP 13 F4), to characterize the view of Democritus.

Note 270

He also says that once upon a time all things were together: DK 59 B1 = TEGP 11 F1.

Note 271

The understanding does its understanding and sets to work from some starting-point: "Understanding is moved by intelligible objects" (*Met.* XII 7 1072^{a}30).

Note 272

The common body (*to koinon sôma*): Democritus' atoms, unlike Anaxagoras' homoeomeries, do not come to be from each other. But because they differ only in size and shape, they are modifications of something common to all of them, namely, body. See *Met.* XII 2 1069^{b}20–24.

Note 273

For they all think that it does not exist pointlessly: Reading οὔτε γὰρ πάντες μάτην αὐτὸ οἴονται εἶναι with P for OCT οὔτε γὰρ μάτην οἷόν τε αὐτὸ εἶναι. See I 1 184^{a}16n(3).

Note 274

Of the unlimited, however, there is no starting-point, since, if there were, it would have a limit: If there were a starting-point on the one hand and the unlimited on the other, then there would have to be a boundary or limit separating the two, whereas the unlimited, by definition, has no boundary or limit.

Note 275

The unlimited . . . seems to be a starting-point of the other things, and to encompass everything, and steer everything: Heraclitus (DK 22 B41 = TEGP 40 F27) says that "wisdom steers all things through all," and Parmenides (DK 20 B12.3 = TEGP 26 F12) speaks of "the daemon who steers all things." Neither though could be uncontroversially represented as being among "those who do not

posit other causes beyond the unlimited." Anaximenes (DK 13 B2 = TEGP 8) is perhaps a more likely referent: "as our soul, which is air, controls us, so do breath and air encompass the whole cosmos."
Those who do not posit other causes beyond the unlimited: Namely, those who "thought that the starting-points of all things were of the material kind (*eidos*) only" (*Met.* I 3 983^{b}6–7) = the physicists (*Ph.* III 14 203^{b}15).

Note 276
What is outside the heaven (*to exô tou ouranos*): See III 4 203^{a}7.
In thought (*noêsei*): See II 1 193^{a}9n.

Note 277
Unlimitedly many cosmoses: See II 4 196^{a}25n.

Note 278
204^{a}3–14: Compare *Met.* XI 10 1066^{a}35–^{b}7.

Note 279
The unlimited . . . , being itself something unlimited (*auto ti on apeiron*): This is best understood by looking at the negation of its negation, namely, *ouch heteron ti on*: "When I say that the log is white, I do not say that another thing (*heteron ti*) is white and that thing is coincidentally a log. . . . The log is the underlying subject, which is just (*hoper*) what came to be white, without being another thing (*heteron ti on*) than just what is a log or a particular log" (*APo.* I 22 83^{a}9–14; also I 4 73^{b}5–10). The idea is that the unlimited cannot be the underlying subject for itself, in the way that the Platonic Form of X—the X-itself—is the underlying subject for X. See III 5 204^{a}17–18.

Note 280
Voiced sound (*phônê*): Aristotle sometimes distinguishes *phonos* ("sound in general") from the *phônê* ("cry" or "voice") of an animate being—"*Phônê* is a sort of sound characteristic of something animate" (*DA* II 8 420^{b}5–6)—and sometimes distinguishes *phônê* from *logos* ("rational speech," "language"): "A *phônê* is a signifier of what is pleasant or painful, which is why it is also possessed by the other animals (for their nature goes this far: they not only perceive what is pleasant or painful but also signify them to each other). But *logos* is for making clear what is beneficial or harmful, and hence also what is just or unjust" (*Pol.* I 2 1253^{a}10–15).

Note 281
204^{a}14–17: Compare *Met.* XI 10 1066^{b}9–11.

Note 282
How is it possible for some unlimited-itself to exist (*einai ti auto apeiron*): That is, "how is it possible for the unlimited to intrinsically exist (*kath' auto einai apeiron*)" (*Met.* XI 10 1066^{b}7). Numbers and magnitudes are not substances, or things that intrinsically exist, or exist in their own right, but attributes of substances, inseparable from them, and so ontologically dependent on them. See I 2 185^{a}31n.

Note 283

For the being for the unlimited and the unlimited-itself (*apeiron to auto*) **are the same, if indeed the unlimited is a substance and not predicated of an underlying subject:** The being for X = the essence of X; "the essence [of a thing] and the thing [itself] are in some cases the same—for example, in the case of the primary substances" (*Met.* VII 11 1037^{a}33–^{b}2); the X-itself (= Platonic Form of X) = the essence (substance) of X (I 9 991^{b}2).

Note 284

It has been stated: At III 5 204^{a}14–17.

What it is a coincident of—air or the even: Air (Anaximenes), the even (Pythagoreans). See I 4 203^{a}10–18n.

Note 285

But presumably this inquiry would be universal (*katholou*): Reading ἂν εἴη with P.

Whether it is possible for there to be an unlimited present also in mathematical objects as well and in intelligible ones that have no magnitude also in mathematical objects: "Also in mathematical ones" means "in mathematical ones as well as in perceptible ones." So the presupposition here is that the beings are divided into three kinds: perceptibles, mathematical objects, and intelligible objects. Perceptibles are the concern of natural science; mathematical objects of universal mathematics; intelligible objects (= pure substantial forms) of the primary science or philosophy (= theology). See I 2 185^{a}2, 20n.

Intelligible ones (*noêtois*): An intelligible object or content (*noêma*) is a universal form (*eidos*). Encoded in an appearance, it can be grasped by the understanding (*nous*) when it contemplates (*theôrein*) that appearance: "To the understanding (*dianoêtikê*) soul appearances (*phantasmata*) are like perceptual contents (*aisthêmata*). . . . The part that understands, then, understands the forms in the appearances (*eidê . . . en tois phantasmasi*)" (*DA* III 7 431^{a}14–^{b}10). It differs from an appearance in being a propositional element—an element of something with a truth value: "when someone contemplates (*theôrê[i]*), he must at the same time contemplate an appearance (*phantasma*). . . . However, imagination (*phantasia*) is distinct from affirmation and denial, since truth and falsity involve a combination of intelligible objects (*noêmatôn*)" (8 432^{a}8–12).

Note 286

If we investigate the issue logico-linguistically (*logikôs*): Contrasted with doing so *phusikôs* at III 5 204^{b}10. See III 3 202^{a}22n.

Note 287

204^{b}10–24: Compare *Met.* XI 10 1066^{b}26–36.

Note 288

The elements have a contrariety with each other: See I 6 189^{b}4–5n.

Note 289

About this topic there is a common (*koinon*) statement to be made that applies to all things alike: See III 5 204^{a}34–35n (*koinon* here = *katholou* there).

Note 290

As Heraclitus says that at some time all things become fire: See DK 22 B30–31 = TEGP 47 F29, 51 F30–31, B63–66 =122 F78, 56 F34, 57 F35, 120 F76, B90 = 55 F33.

Note 291

204^{b}32–205^{a}7: Compare *Met.* XI 10 1066^{b}36–1067^{a}7.

Note 292

The general question, though, of whether it is possible or impossible for there to be an unlimited perceptible body must be investigated on the basis of the following considerations: Reading δεῖ δὲ κατὰ παντὸς ἐκ τῶνδε σκοπεῖν, εἰ ἐνδέχεται ἢ οὐκ ἐνδέχεται εἶναι σῶμα ἄπειρον αἰσθητόν with the mss. OCT secludes σῶμα ἄπειρον αἰσθητόν, while Hussey, not without some justification, omits the entire sentence.

The general question: As opposed to the question of whether the unlimited body could be one of the elements.

Note 293

There is a certain place for each, and the same place for a part of it and for the whole—for example, for the totality of earth and for a single clod: In the case of sublunary animals, up and down, front and back, right and left are not just spatially or relationally distinguished but functionally and absolutely so: "the part from which the distribution of nourishment and growth derives in each living thing is up and the last part toward which this spatially moves is down—the one is a sort of starting-point, the other a limit; and up is a starting-point" (*IA* 2 705^{a}32–^{b}2). Similarly, the front is a starting-point, because it is where the perceptual organs are located (4 705^{b}10–13). Even in earthworms, where right and left are more difficult to distinguish perceptually, the functional difference between them still exists: "the starting-point of the movement is the same in all animals and by nature has its position in the same place; and it is from the right that the starting-point of movement derives" (5 706^{a}10–13). Thus human beings put their left foot forward, unless they accidentally do the opposite, since "they are moved not by the foot they put in front, but by the one with which they step off" (5 706^{a}8–9). In the case of the sphere of the fixed stars, the same applies not just to right and left but to all six functionally defined directions: "We should not be puzzled, because the shape of the universe is spherical, about how there will be a left and a right of it when all its parts are similar and all the time moving. We should instead understand it as being just like a thing in which there is a difference between right and left, and other shape-related aspects, about which a sphere has then been placed, since it will possess the difference in function, but will seem not to, because of the uniformity of the shape. It is the same way with the starting-point of movement. For even if it never began moving, all the same it must have a starting-point from which it would have begun if it had begun moving, and, if it were to come to a stop, from which it would start moving again" (*Cael.* II 2 285^{a}31–^{b}8). It is these functionally defined directions that determine unconditional or absolute locations or places in the universe (*Ph.* III 5 205^{b}31–34). The place that is unconditionally up, for example, as opposed to being up relative to something else, is at the periphery of the sphere of the fixed stars; the one that is unconditionally down is at its center (*Cael.* IV 2 308^{a}17–29). It is absolute places, in turn, that figure in the essential definitions of the five elements, making them the closest analog of form that these elements possess (*Ph.* VIII 4 255^{b}13–17). Thus earth, for example, is what is unconditionally heavy, since unless it is opposed, it naturally moves toward the place at the center. The center of the universe, therefore, is its *proper place*—the place where it would be unless something else prevented it. It is in this sense of place, then, that a part of earth has the same place as that of earth as a whole.

Note 294

[2b-ii] if the unlimited perceptible body is uniform: This is an additional argument against [2b] the existence of a simple (*haplous*) unlimited body, because the relevant sort of simplicity is uniformity.

It will be immovable or will always be moving: The idea is perhaps this. If the whole is uniform or homogeneous, each sub-place of its proper place is equally proper to each of its parts. So either none will move naturally from whichever sub-place it happens to be in, or, if it is moving, it will never stop, since it would stop and be at rest only in its distinctive proper sub-place—which *ex hypothesi* it does not have.

Note 295

The body of the universe will not be one except by contact: And so will not be intrinsically one. See *Met.* V 6 1016^{a}7, and, on the significance of the issue, XII 1 1069^{a}19–21.

Note 296

205^{a}10–26: Compare *Met.* XI 10 1067^{a}7–20.

Limited in kind the parts cannot be, since then those of one kind will be unlimited and those of another will not (if the universe is unlimited): If the universe has parts of kinds K$_1$ . . . K$_n$ (where n is finite), then for *some* K$_j$ the parts of K$_j$ must be unlimited. But they cannot all be unlimited. Hence K$_j$ will destroy the other kinds, since these are contraries. See III 5 204^{b}10–24.

Note 297

The universe must be limited too: Reading πεπεράνθαι ἀναγκαῖον; OCT secludes.

205^{a}29–32: Compare *Met.* XI 10 1067^{a}20–23.

Note 298

Each of the former [fire, earth] clearly has a definite place, whereas the others [water, air] play a double game (*epamphoterizein*) between up and down: Fire and earth have definite places, namely, the circumference of the universe, in the case of fire, and the center of the universe, in the case of earth. So neither of them can be unlimited, for the reason just given about the fit between body and place. Water and air, by contrast, have tendencies to move up (relative to earth) and down (relative to fire), which is why they play a double game, why their proper or natural places are less definite, and why they themselves are more readily thought to be unlimited. See III 5 205^{a}10–12n.

Note 299

Anaxagoras for his part speaks in an out-of-place way about the unlimited being at rest: The argument Aristotle attributes to Anaxagoras is otherwise unattested. As presented, it runs as follows: (1) The unlimited is within itself, since there is nothing bigger than it that can contain it. (2) Where a thing is, it is by its nature. (3) Therefore, it is by its nature that the unlimited is in itself. (4) Therefore, it is by its nature that it holds itself fixed in place. Aristotle responds that (2) is false.

Out-of-place way (*atopôs*): *Atopos* means "strange" or "paradoxical," but it also means "non-spatial." Aristotle's pun relies on this double meaning, which "out-of-place" attempts to preserve.

Note 300

Anything else could be not moving: Reading ὁτιοῦν ἄλλο with P and most mss. for OCT ὅτι οὐκ ἔχει ἀλλαχῇ κινεῖσθαι ("it might be not moving because it has nowhere else to move to").

Note 301

Provided it were still shut in (*eirgmenê*) **by the center:** Because place is "the limit of the surrounding body at which it is in contact with the thing surrounded" (IV 4 212^{a}6–6a), the *place* that is the center of the universe is not a geometrical point but rather a sphere, whose size is determined by the amount of unmixed earth the universe contains. Hence Aristotle describes its place as "the one *around* the center" (*Cael.* I 8 277^{b}15–16). If *all* the elements were in their proper places, then, earth would be shut inside the innermost sphere. Moreover, all the earth within that sphere would be at rest in its proper place, and so none would be actively striving, so to speak, to get closer to the place's center point.

Note 302

These are not merely relative to us or to position (*thesei*): Or, perhaps, "by convention." But notice *thesei* ("in position") at IV 1 208^{b}21.

Note 303

The six differentiae of place—up and down, before and behind, and right and left—cannot exist in the unlimited: Because what is unlimited cannot move in any of them. See III 5 205^{a}10–12n.

Note 304

205^{b}24–206^{a}7: Compare *Met.* XI 10 1067^{a}23–33.

There is a certain limit: For example, the circumference of the universe is the limit in the case of up; the center of the universe, in the case of down. See III 5 205^{a}10–12n.

Note 305

Magnitudes will not [always] be divisible into magnitudes: So there will be indivisible magnitudes, which is impossible (VI 1).

Note 306

Arbitrator (*diaitêtês*): "Those who are going to judge the truth adequately should be arbitrators rather than parties to the dispute" (*Cael.* I 10 279^b10–12): "Everywhere, though, an arbitrator (*diaitêtês*) is most trusted, and the middling person is an arbitrator" (*Pol.* IV 12 1297^a5–6); "When people are involved in dispute they take refuge in a judge. Going to a judge, however, is going to justice, since a judge is meant to be, as it were, justice ensouled. Also, they seek a judge as an intermediary—in fact, some people call judges 'mediators,' on the supposition that a person who can hit the mean is the one who will hit what is just. Hence what is just is a mean in some way, if indeed a judge is also one" (*NE* V 6 1132^a19–24).

Note 307

It has been stated, however, that a magnitude is not actually unlimited: III 5 204^a20–30.

Note 308

Indivisible lines (*atomous grammas*): "As to points, from what will their presence in lines come? In fact, Plato used even to contest this kind (*genos*) as being a geometrical dogma. Instead, he called it 'starting-point of line,' and often posited that it consisted of indivisible lines" (*Met.* I 9 992^a19–22). Plato's rejection of points in favor of indivisible lines, however, is otherwise unattested. *GC* I 2 316^a11–12 mentions those who argue in a logico-linguistic way that there must be indivisible magnitudes "because otherwise [the Form of] the triangle will be more than one." The author of *LI* gives the argument: "If there is an Idea of line, and if the first of the things is called by the same name, then, since the parts are prior to the whole, line-itself must be indivisible (*adiairetos*). And in the same way so must the [Idea of] the square, the triangle, the other [Ideas of] figures, and in general plane-itself and body-itself, since otherwise there will be things prior to each of them" (968^a9–14).

Note 309

Things are said to be in many ways: See I 2 185^a21n.

Note 310

The unlimited exists in distinct ways in the case of time, in the case of humans, and in the case of the division of magnitudes: Only two ways are involved, not three: (1a) time and (1b) humans (= the human race) on the one hand, (2) magnitudes on the other (III 6 206^a33–$^b3$). In the case of (2) the potentially unlimited is actualized in a potentially unlimited series of cuts, each of which, when made, results in an actual but limited part of the whole, which remains in actual existence as subsequent cuts are made. In the case of (1a) a limited part (the now) becomes actual, but ceases to actually exist when a subsequent part becomes actual—a process that is potentially unlimited. What allows Aristotle to group (1b) with (1a) is his doctrine of the eternality of species: "Some beings are eternal and divine, while others admit of both being and not being. But what is noble and divine is always, in accord with its own nature, the cause of what is better in such things as admit of better and worse, and what is not eternal does admit both of being and not being, and can partake in better and worse. And soul is better than body, and the animate (because it has soul) than the inanimate, being than not being, and living than not living. It is due to these causes, then, that the generation of animals exists. For since it is impossible for such a genus of things as animals to be of an eternal nature, what comes to be is eternal in the only way possible. As a particular, certainly, it is impossible. For the substance of the beings is in the particular, and if indeed it were eternal, the particular would be eternal. But as a species, it is possible. That is why there is always a genus of humans, of animals, and of plants" (*GA* II 1 $731^{b}24$–$732^{a}1$; also *GC* II 11 $337^{a}34$–$338^{b}5$, *Cael.* I 12).

Note 311
In general the unlimited exists in the following way: in virtue of one thing always being taken after another, and each thing taken is always limited, but is always *one thing followed by another*: The application of this to things infinite by division is clear enough, its less clear application to things infinite by addition is discussed at III 6 $206^{b}3$–33.

Note 312
Again, though, things are said to be in many ways . . . yet always *one thing followed by another*: OCT secludes these lines, which I retain. Though they do interrupt the line of argument, they can plausibly be read as a sort of afterthought, expanding in a useful way on the less detailed discussion of days and games at III 6 $206^{a}21$–25.

Note 313
The one by addition: Reading τὸ κατὰ πρόσθεσιν for OCT and mss. κατὰ πρόσθεσιν.

Note 314
As it is seen being divided without limit, it will ipso facto appear that by being added it tends toward something definite: What is added are the parts which at each stage the unlimited by division is divided into. The sum of these tends to, but in Aristotle's view, never reaches a definite limit.

Note 315
Any definite quantity whatsoever: That is, however small it may be.

Note 316
And in fact in the way in which we say a day is and a competition is: Reading καὶ ἐντελεχείᾳ δὲ ἔστιν with Cooper and the mss. for OCT and P καὶ ἐντελεχείᾳ δὲ ἔστιν.

Note 317
Outside the cosmos: Compare III 4 $203^{a}7$–8.

Note 318
As we said: At III 6 206^{b}3–12.

Note 319
Plato posited two unlimiteds: Namely, the great and the small. See III 4 203^{a}15–16 and I 4 187^{a}17n.

Note 320
[Plato] posits numbers only up to ten: Compare: "Those who accept the Ideas say that the Ideas are numbers, and where numbers are concerned they sometimes speak as if they were unlimited, sometimes as if, being defined up to ten, they were finite" (*Met.* XII 8 1073^{a}18–21; also XIII 8 1084^{a}12, 31).

Note 321
It is not what nothing (*mêden*) is outside of, but rather what something (*ti*) is always outside of, that is unlimited: Here and throughout this paragraph "nothing" and "something" should be understood as "no part" and "some part."

Note 322
People say that rings without a socket for a gemstone are unlimited: A socket creates a break in the circle.

Note 323
In the case of the circle, though, it does not happen that way, but only that the next thing is always a distinct one: Whatever point P_1 you reach in traveling around a circle, there is always a point $P_2 \neq P_1$ that lies ahead, but for your travel to go on and on you must reach or take P_2 again and again. Thus your travel is not in the strict sense unlimited, even though it need never end.

Note 342
"All": Usually, "universe," but here any totality. See III 6 207^{a}18, 20, and I 2 185^{b}7n.
Whatever may be absent: That is, however small it may be.

Note 325
Whole and complete: "Something is said to be a whole if none of the parts of which it is said to be by nature a whole is absent from it" (*Met.* V 26 1023^{b}26–27); "What is said to be complete is, in one way, that outside which not even one part is to be found—for example, the complete time of each thing is the one outside which there is no time to be found that is part of that time" (16 1021^{b}12–14).

Note 326
Parmenides says that the whole is limited, "equal in all directions from the middle": DK28 B8.44 = TEGP 17 F8.44.

Note 327
The unlimited . . . is a whole and limited not intrinsically but with regard to something else: Namely, the form of whatever magnitude it is the matter of. See III 6 207^{a}25–27.

Note 328

The unlimited, insofar as it is such, is unknowable, since the matter has no form: “Speaking universally about every perceptual capacity, though, we must take it that the perceptual capacity is what can receive the perceptible forms without the matter, as wax receives the seal of the signet-ring without the iron or the gold” (*DA* II 12 424^{a}17–20). “Of the understanding the activities are [acts of] understanding (*noêsais*), which are [acts of] seeing intelligible things (*horaseis ousai noêtôn*)” (*Protr.* B24); “Understanding is a capacity for being such things [intelligible objects] without their matter” (*DA* III 4 430^{a}7–8). It is not, then, that bronze or wood are unknowable but rather that what is known about them, as of anything, is always their formal component and not their material one. Matter as such is intrinsically unknowable because what perception and understanding can “receive” or “be” is always the form without the matter. Matter that is intrinsically featureless, and that might be considered unknowable for this reason, is discussed at *Met.* VII 3 1029^{a}20–21.

Note 329

If indeed the unlimited encompasses in the case of perceptibles, in the case of intelligible objects too, the great and the small should encompass them: If the unlimited in the perceptible realm encompasses everything, then the great and the small, which is Plato’s unlimited and an intelligible object, ought to encompass everything, including the Forms, that are in the intelligible realm. Yet Plato posits it as the material element, and the one as the formal element, from which the Forms on the one hand and the perceptibles on the other are generated (*Met.* I 6 987^{b}20–21, 988^{a}10–14).

Note 330

As the matter: Reading ὡς ὕλη with P for OCT ὕλη.

Note 331

“Two” and “three” are paronymous names, and similarly with each of the other numbers: “When things get their name from something, with a difference of ending, they are said to be paronymous—for example, from grammar, the grammarian, and from courage, the courageous person” (*Cat.* 1 1^{a}12–15). Paronymy is not simply a linguistic phenomenon, then, but also an ontological one, since it is named things that are paronymously related not simply names. Thus the definition of a courageous person is a person in whom courage is present, and of a grammarian, a person in whom the knowledge of grammar is present. Similarly, in our text what is being claimed is that what is designated by the noun “two” is paronymously related to what is designated by the adjective “two” because the definition of two (designated by the noun) is two (designated by the adjective) units. Then this fact is used to explain why in the direction of the least the number series reaches a stop at one unit.

Note 332

Think of (*noêsai*): See II 1 193^{a}9n.

Note 333

This number is not separable from the process of bisection: Reading ἀλλ' οὐ χωριστὸς ὁ ἀριθμὸς οὗτος τῆς διχοτομίας. OCT deletes τῆς διχοτομίας ["from the process of bisection"] as a gloss. But without it the text attributes to one number a feature that belongs indifferently to all numbers. For no number has the attribute, characteristic of substances alone, of being separable *tout court.* See I 2 185^{a}31n.

The unlimited does not stand fast but comes to be, just like time and the number of time: See III 6 206^{a}21–^{b}3.

Number of time: That is, the number that measures time.

Note 334

There would be something greater than the heaven: The relevant heaven is "the whole [cosmos] and the universe." See II 4 196^{a}25n.

Note 335

207^{b}21–25: Compare *Met.* XI 10 1067^{a}33–37.

Note 336

For now let us make use of these notions: Namely, unlimited magnitude, unlimited movement, unlimited time.

Later we shall state what each of them is and why every magnitude is divisible into magnitudes: At V 1–2, 4.

Note 337

Another magnitude of any size you like can be divided in the same ratio as the greatest one can, so that, as regards proof at least, it makes no difference to them that its being among the magnitudes that actually exist is not necessary: Reading οὐδεν ἐστιν ἀναγκαῖον with P; OCT omits. The argument is this. Any line, however short, can be divided in the same ratio as any other line, however long, so that anything that can be proved using even the longest one (the greatest magnitude) can be proved using a shorter one.

Note 338

That is why it is absurd to make it what encompasses and not what is encompassed: See III 4 203^{b}11, III 6 207^{a}18–32.

Note 339

The arguments that seem to support the view that the unlimited exists not only potentially but as something definite: These are given at III 4 203^{b}15–30, and are numbered here as there.

Note 340

Some of them are not necessities (*anagkaia*), while others admit of other true replies: The distinction being drawn is not entirely clear. At *APr.* I 32 47^{a}33–35 a syllogism is distinguished from a "necessity (*anagkaion*)" in such a way as to suggest that necessities are what we would call valid deductions. This suggests that some objections will be to the deductive validity of the arguments to be examined, others to their soundness, or the truth of their premises. [3] seems to be an objection of the first sort; [1], [4], and [5] of the second sort.

Note 341
Nor is it possible for any random thing to make contact with any random thing: "Things are making contact [or touching] when their extremes are together in place" (*Met.* XI 12 1068^{b}27) Thus "there is no contact in numbers" (XIII 9 1085^{a}3–4), even though these are limited.

Note 342
Thought (*noêsei*): See II 1 193^{a}9n.

Note 343
It is not because of this, namely, that someone thinks it is so, anyone exceeds the size of the town or the size that we have: Reading ἔξω <τοῦ μεγέθους> τοῦ ἄστεός with P; OCT secludes τοῦ ἄστεός.
But because it is the case—that someone thinks it is so is coincidental: "It is not because we truly think you to be pale that you are pale, but it is because of your being pale that we who say this grasp what is true" (*Met.* IX 10 1051^{b}6–9).

Book IV

Note 344
Goat-stag (*tragelaphos*): Here, as at *Int.* 1 16^{a}16, *APo.* II 7 92^{b}7, *APr.* I 38 49^{a}24, Aristotle, like Plato, *Rep.* VI 488a, treats goat-stags as mythical. Dover, p. 309, notes that the name also applies to a real genus "represented by several species in Europe and the Middle East."

Note 345
And movement in the most common and strictest sense, which we call "spatial movement," is movement with respect to place: See *Ph.* VIII 7 260^{a}21–^{b}7.
Strictest sense: See III 3 202^{b}20n.

Note 346
We have nothing from previous thinkers either by way of going through the puzzles (*proêporêmenon*) **about it or of making us puzzle-free** (*proêuporêmenon*): "Now for those who wish to be puzzle-free (*euporêsai*) it is useful to go through the puzzles (*diaporêsai*) well. For the subsequent puzzle-free condition (*euporia*) is reached by untying the knots produced by the puzzles raised in advance (*aporoumenôn*), and it is not possible to untie a knot you are unaware of. But a puzzle in thought makes clear the existence of a knot in the subject matter. For insofar as thought is puzzled it is like people who are tied up, since in both cases it is impossible to move forward" (*Met.* III 1 995^{a}27–33).

Note 347
Then some other bodies occupy this same place: Reading ὅτε with Pelegrin and the mss. for OCT ὀτέ.

Note 348

Place has a certain capacity: An element's proper place (III 5 205^{a}10n) figures in its essential definition, making it the closest analog of form that it possesses. The capacity or power of attraction here attributed to place is therefore that of form: "the spatial movement of each body to its own place is its spatial movement toward its own form" (*Cael.* IV 3 310^{a}33–^{b}1). That is why in any world composed of the same elements as ours, those elements must have the forms they do here, and so must move to the places they do here: "It is clear, therefore, that one of the bodies will spatially move naturally away from the center and another toward the center, since all fire [there] must have the same form as fire [here], and so with each of the others" (I 8 276^{b}4–7). No attractive force or power, in other words, is being attributed to place itself. This is presumably relevant to [P4] (209^{a}18–22).

Note 349

The rest of the six directions: See III 5 205^{a}10n, 6 206^{a}5–7n.

Note 350

Hesiod: One of the oldest known Greek poets (c. 700 BC), author of the *Theogony*, *Works and Days*, and the *Catalogue of Women*. His works, like those of Homer, played a substantial role in Greek education. The lines Aristotle quotes are *Theogony*, 116–117. He understands chaos to be the equivalent of empty space, which is what *chaos* originally meant. See Chantraine, p. 1246.

Note 351

That without which nothing else can exist, whereas it can exist without the others, must be first: "Others, however, are said to be prior in nature and substance, when it is possible for them to be without other things, but not the others without them—a distinction used by Plato" (*Met.* V 1019^{a}1–4).

Note 352

It cannot be an element or composed of elements, whether of corporeal (*sômatikôn*) or of incorporeal ones (*asômatôn*): The corporeal elements are earth, water, air, and fire (*Cael.* I 8 277^{a}14); the incorporeal element is ether (IV 5 212^{b}21n).

Note 353

The elements of perceptible bodies: Reading τῶν αἰσθητῶν σωμάτων with P and the better mss. for OCT τῶν αἰσθητῶν.

Note 354

Form and account (*logos*) of things: Aristotle is not always careful to distinguish linguistic items, such as accounts or definitions, from their ontological correlates. For example, he speaks of Socrates as not separating "the definitions" from perceptibles, when it is the essences that are the ontological correlates of the definitions to which he is referring (*Met.* XIII 4 1078^{b}30–31), and of the account of X as composed of the matter and the activation (= form), when it is X itself—the ontological correlate of the account—that is so composed (VIII 6 1045^{a}34–35). On *logos* more generally, see I 2 185^{b}2n.

Note 355
Zeno's puzzle: Zeno of Elea (DK 29 = TEGP pp. 245–270) was a follower and defender of Parmenides. For Aristotle's response, see IV 5 212^b27–29.

Note 356
The extended space for the magnitude (*to diastêma tou megethous*): A *diastêma* in music is an interval (*Pr.* XIX 47 922^b6) and in spatial magnitudes, a dimension (*Ph.* IV 1 209^a4). By extension, just as there are extreme and middle terms in a syllogism, so syllogisms themselves are *diastêmata* or intervals connecting the minor term to the major term (*APr.* I 25 42^b10) and premises are sub-intervals of those intervals, so that *protasis* ("premise," "proposition") and *diastêma* are equivalent (I 4 26^b1). Terms, as sub-intervals of those sub-intervals, are also *diastêmata*, so that the number of terms in a sequence of syllogisms is equal to the number of *diastêmata* in them (I 25 42^b1–26). Here the relevant *diastêma* is not so much a dimension (length, for example, or depth) but the thing that has the dimension, which in the present instance is a space or extension.

Note 357
Plato too says in the *Timaeus* that matter and space are the same thing: At *Ti.* 51^a4–$^b1$, with 52^a8, $^b4$.

Note 358
Theoretical knowledge of the highest sort (*akrotatên thean*): Or, "the best seat in the theater." This is the sort of knowledge provided by primary philosophy, which is the science of the "highest (*akrotatas*) causes" (*Met.* IV 1 1003^a26), and the only one that gets a theoretical grasp on the sort of form that is separate from matter. See I 2 185^a2n, 9 192^a35n, and Introduction, pp. xx–xxxii.

Note 359
As we said: At IV 1 208^b1–8.

Note 360
State (*hexis*): See I 4 188^a7n.
Separable: See I 2 185^a31n.

Note 361
Plato of course ought to tell us why the Forms and the numbers are not in a place, if indeed place is the participative, whether this be the great and the small or matter: "What the underlying matter is, of which the Forms are said in the case of the perceptibles, and the one in the case of the Forms, is evidently a dyad, the great and the small" (*Met.* I 6 988^a11–14). The idea is that if perceptibles are in a place because they have matter (the great and the small), then the Forms should also be in a place, since they are generated from the great and the small and the one. **The numbers:** "Apart from both the perceptibles and the Forms are the objects of mathematics [= the numbers], he says, which are intermediate between them, differing from the perceptible ones in being eternal and immovable, and from the Forms in that there are many similar ones, whereas the Form itself in each case is

one only" (*Met.* I 6 987^{b}14–18). As with the Forms themselves, numbers that are similar will need some sort of matter to distinguish them, which, if matter is the participative, will be of the sort whose possession entails location in a place, as in the case of perceptibles.

Note 362
The indefinite: That is, the matter. See IV 2 209^{b}9.

Note 363
Substance: That is, essence. See I 2 185^{a}23n.

Notes 364
How many ways one thing is said to be *in* another: Because place and being in a place are tightly tied to each other, Aristotle begins by going through the various ways in which one thing can be said to be *in* another. These are tied, in turn, to those in which one thing can be said to have or hold another: "Things are said to be in something in ways that are similar to and correspond to those in which they are said to have [or hold] them" (*Met.* V 23 1023^{a}23–25). This does not seem to be entirely true, however, where the distinctions drawn in our text are concerned. Thus our [1], [3], and [8] all seem to correspond to just the following single sense of "have" or "hold": "What encompasses something is said to hold what it encompasses. For what is in what encompasses it is said to be held by it—for example, that the vessel holds liquid, and the city human beings, and the ship sailors. And it is in this way that the whole has its parts" (1023^{a}14–17). But no sense of "in" seems to correspond to the following sense of "hold": "What hinders a thing from moving or acting in accord with its own impulse is said to hold it—for example, the pillars hold the weight lying on them" (1023^{a}17–19). But perhaps we should see this as included under [5], since a first cause of something's being kept from moving would seem to be on a par with the first cause of its movement. Finally, no sense of "have" or "hold" seems to correspond to [7].

Note 365
[4] The part of the species in the account: That is, the differentiae, no less than the genus, are referred to in the account (definition) of the species: "There is nothing else in the definition except the genus that is mentioned first and the differentiae" (*Met.* VII 12 1037^{b}29–30).

Note 366
[5] As health is in hot and cold things: Because health, and indeed life itself, depends on a proper balance of hot and cold things, and so lies in them: "We might get a theoretical grasp on the cause of all these facts [about length of life] as follows. We must grasp that a living being is by nature moist and hot, and life also has such a nature, whereas old age is cold and dry as is a dead body. For it is evident that things are this way. But the matter of the bodies of animals consists of these: the hot, the cold, the dry, and the moist. Thus as they grow old they must become dry, which is why the moisture in them must not be too easily dried" (*Long.* 5 466^{a}17–23). The corresponding sense of "have" is this: "What a thing is present in,

as in something receptive of it, is said to have it—for example, the bronze has the form of the statue, and the body has the disease" (*Met.* V 23 1023^{a}11–13).

Note 367
[6] As the affairs of the Greeks are in the king, and in general in the first cause of movement: This use of "in" corresponds roughly to the English phrase "in the hands of." This is made clear by the corresponding use of "have": "One way [to have] is to treat it in accord with the possessor's own nature or in accord with its own impulse. That is why a fever is said to have hold of a human being and tyrants to have hold of their cities, and people to have the clothes they wear" (*Met.* V 23 1023^{a}8–11). See also II 7 198^{a}19–20.
The first thing capable of causing movement: Probably the ultimate cause (or first item in the explanatory causal chain leading to the effect) rather than the proximate one (or last item in that causal chain).

Note 368
[7] As in the good, and in general as in the end: It is not entirely clear what Aristotle has in mind, but the fact that [7] immediately follows [6] suggests that it is the latter's analogue expressed in terms of final or teleological causes rather than efficient ones. We see these two sorts of causes connected in the relevant way in the description of politics (political science), whose end encompasses those of the other things over which it exerts control (*NE* I 2 1094^{a}27–^{b}7). Thus as the king controls Athenian affairs, by prescribing what the Athenians are to do, so the good or end he aims at encompasses them and their ends.

Note 369
Either intrinsically or by virtue of something else: See IV 3 209^{a}31.

Note 370
A human being is said to be pale, because his surface is pale: Surface is the primary thing in which color comes to be, so that something else is colored in virtue of having a surface in which that color is present (*Met.* V 17 1022^{a}16–17). See IV 3 210^{b}4–6.
Or to know science because his rationally calculative part (*logistikon*) does: Usually, the *logistikon* is a sub-part of the part of the soul that has reason, and is responsible not for scientific knowledge, which is usually assigned to the other sub-part, the *epistêmonikon* (hence its name), but for practical deliberation and the like (*NE* VI 1 1139^{a}3–15). Since *psuchê* ("soul") is used as a replacement for *to logistikon* at IV 3 210^{b}1, we may infer that Aristotle is speaking no more precisely than his purposes require.

Note 371
Primary way: That is, [8].

Note 372
These things—the surface and the pale—are distinct in form, and each has a distinct nature and capacity: In the last analysis, the human being is pale because the pale is present in his surface. But surface and pale are distinct in form, nature,

and capacity. So this is not a case of a thing being in itself. Similarly, for other such cases.

Note 373

When we investigate inductively: As at IV 3 210^{a}25–^{b}8. See I 2 185^{a}14n.

When we do so by argument (*logô[i]*): That is, by the argument or process of reasoning that follows at IV 3 210^{b}10–21.

Note 374

The jar will be in itself, if a thing whose nature is receptive can be in itself, and furthermore what it is receptive of—for example, if wine, then wine—will be in it: (1) If X is by nature receptive, then X can be in X (supposition). (2) But what X is receptive of—namely, Y—can also (coincidentally) be in X. (3) So X and Y can be in X at the same time. But (3) is impossible, so (1) is false.

Note 375

In the way in which health is in hot things as a state: See VII 3 246^{b}4–6.

Note 376

Going through the puzzles (*diêporêmena*): See IV 1 208^{a}34–^{b}1n.

Note 377

[6] Each body should by nature spatially move to and remain in its proper place, and this is does either upward or downward: Aristotle ignores the other four directions and the other proper places, presumably (although not certainly) for the sake of simplicity. See III 5 205^{a}10n.

Note 378

And we must try to make our investigation . . . so that the cause of the difficulty and of the puzzles concerning it will be evident, since this is the best way of showing (*deiknuoito*) **each thing:** "When a reasonable explanation is given of why an untrue view appears true, this makes us more convinced of the true view" (*NE* VII 14 1154^{a}24–25). See Introduction, pp. xliii.

The puzzles (*aporêmatôn*): At *Top.* VIII 11 162^{a}17–18 (perhaps a gloss) an *aporêma* is defined as "a dialectical deduction of a contradiction," but elsewhere, as here, it is simply a puzzle or *aporia*. See *APr.* I 1 71^{a}29, *APo.* II 6 92^{a}29, *GC* I 10 327^{b}32, *Met.* IV 2 1004^{a}34, 6 1011^{a}6, XIII 2 1077^{a}1.

Note 379

The heaven: See II 4 196^{a}25n.

Note 380

The extremities (*eschata*) **of things that are making contact are in the same place:** "Things are making contact when their extremes (*akra*) are together in place" (*Met.* XI 12 1068^{b}27).

Note 381

Further, when it is not divided . . . in the vessel: This paragraph is secluded in OCT, perhaps correctly, as a dittograph of IV 4 211^{a}29–36.

Note 382

If there were a certain extended space that remained unchanged in its own place: Reading εἰ δ’ ἦν τι διάστημα τὸ πεφυκὸς καὶ μένον ἐν τῷ αὐτῷ τόπῳ with P and the mss. for OCT εἰ δ’ ἦν τι [τὸ] διάστημα <καθ’ αὑ>τὸ πεφυκὸς <εἶναι> καὶ μένον, ἐν τῷ αὐτῷ ἄπειροι ἂν ἦσαν τόποι (“if there were some intrinsic extended space that was what was naturally there and that remained unchanged . . .”).

Note 383

The place of the part, in which it moves when the whole vessel changes places is not a distinct one; rather, it is the same one: The argument seems to be this. Suppose that P_1 is a place that is part of P, which is the place inside PV_1, which is the proper place of a vessel V. When V moves from PV_1 to another proper place PV_2, the place within which P_1 moves does not change, but continues to be P. If P_1 were an intrinsic being, however, with a proper place of its own, this would not be true. Instead P_1 would move from a proper place inside PV_1 to one inside PV_2.

Note 384

It is in the place in which they are that the air and the water (or the parts of the water) change places, not in that place in which they come to be, which is part of the place that is the place of the whole heaven: This is offered in support of the claim made in the previous sentence and explained in the attached note. What we are apparently to imagine is not air changing places with water, but one or the other, whichever happens to be in V, moving inside it, while V moves from PV_1 to PV_2. These interior movements occur in P, the interior place of V, not in PV_2. And these are discrete places. For PV_2, as the proper place of V, is continuous with the place of the whole heaven, whereas P is cut off from the latter by V itself (imagine it as being sealed, so that what does the cutting off is the material between its interior and exterior surfaces).

The place of the whole heaven: That is, the whole heaven’s interior place or space. See II 4 196^a25n.

Note 385

The matter, as was said earlier, is neither separable from the thing nor encompasses it: See IV 1 209^b23, III 7 207^a35.

Note 386

That is why it is more the whole river that is the place, because as a whole it is immovable: X is moving inside a boat Y that is moving on river Z. In relation to X, Y serves more as a vessel than a place, since Y is moving, and places cannot move. In what place, then, is X moving? It is Z, which regarded as such is, like all places, immovable.

Note 387

[2] The first immovable limit of what encompasses the thing—this is its place (*ho topos*): Earlier Aristotle has defined place as [1] “the limit of what encompasses something at which it is in contact with what is encompassed” (IV 4 212^a5–6a). Since [1] makes no reference to immovability, and [2], taken as a general definition is circular (since "immovable" means "incapable of changing *place*"), it seems better to take [2] not as a new general definition, supposedly equivalent to [1], but as a special case of [1], intended to apply only to things like X (previous note) that are moving within things that are themselves moving. Thus the place of such things, but not place generally, is what [2] is supposed to capture. To signal as much I have translated *to* prior to *topos* here as "its," but omitted it, as signaling a reference to space generally, at IV 4 212^{a}5. See *Met.* VII 10 1035^{b}27–31.

Note 388

The center of the heaven and the extreme limit (relative to us) of its circular spatial movement (*tês kuklô[i] phoras*): The earth is at the center of a series of rotating transparent spheres, the outermost of which is the primary heaven S—the sphere of the fixed stars (*Cael.* II 6 288^{a}13–17, 12 292^{b}22–23). The inner surface of S—as opposed to its outer one—is its extreme limit relative to, or facing, us. In ascribing this limit to the heaven's circular spatial movement, rather than to the heaven itself, Aristotle engages in a bit of harmless shorthand.
The heaven: Here the heaven is S, since it is described as moving in a circle. See II 4 196^{a}25n and compare IV 6 212^{b}13–14: "what is up above is moved in a circle."
Most of all "up" and "down" in the strict sense: See III 5 205^{a}10n.

Note 389

Even if something of the latter sort were to be water, its parts will be moved, since they encompass each other, whereas the all (*to pan*) **will [1] in one way move and [2] in another not:** *To pan*, which refers to the universe as a whole (I 2 185^{b}7n), here seems to be more particularly the primary heaven (II 4 196^{a}25n). The point being made emerges more clearly, however, if we translate it more literally as "the all." For in one sense [1] "all" means "all individually," but in another it means [2] "all collectively." "For 'all,' 'both,' 'odd,' and 'even' are ambiguous, and produce contentious deductions even in [dialectical] arguments" (*Pol.* II 3 1261^{b}28–30). In sense [1] the all can move in a circle, since this involves no place besides that of its parts, but in sense [2] it cannot, since there is no place besides the one it is in for it to move to. The parts, by contrast, can move both in sense [1] and in sense [2], as the remainder of the paragraph goes on to show.

Note 390

As was said: At IV 4 211^{a}17–^{b}5.

Note 391

A homoeomerous thing: See I 4 187^{a}25n.
Continuous: See I 2 185^{b}8n.

Note 392

The heaven, as has been said, is not anywhere as a whole: See IV 5 212^{a}32. The heaven = the primary heaven.
Yet as it *is* moved: Reading ἐφ' ὃ with Hussey and P for OCT ἐφ' ᾧ ("but in the direction in which it is moved").

It is in fact a place for its parts, since they are in contact with each other: The primary heaven—or "what is up above," as it is called at IV 5 212^{b}14—is in circular movement, which is the only sort possible for it, since it has no new place to move to. Its parts, however, because they are contact, are encompassed, and so are potentially in places, which is why they are described as "all in a way (*pôs*) in a place" (212^{b}12–13).

Note 393

Ether (*aithêr*): Ether is the name given by Anaxagoras (*Cael.* I 3 270^{b}20–25) to what Aristotle calls "primary body" (*sôma prôton*), which is the element that constitutes the heavenly bodies, is "different from and additional to the elemental ones met with here, more divine than, and prior to, all of them" (2 269^{a}30–32), and is both transparent and in eternal circular movement (3 270^{a}12–^{b}25).

Note 394

All the puzzles: Those numbered [P1]–[P6] at IV 1 209^{a}2–30. I have preserved the numbering here. [P3] is perhaps implicitly resolved by [P3*], while [P4] seems to be omitted altogether.

Note 395

What is adjacent to something and not by force in contact with it is of the same kind (*suggenês*) **as it—if they are naturally unified, they cannot affect each other, whereas if they are [by force] in contact, one is affected and the other affects it:** The reference is to the series, earth, water, air, fire, in which adjacent elements share a differentia. Earth (cold, dry) is at the bottom, water (wet, cold) comes next, then air (hot, wet), then fire (dry, hot). Focus on air: it shares a differentia (wet) with water and another with fire (hot), and so is of the same kind as each. But because it differs from each in its other differentia (from water in being hot, from fire in being wet), it does not, when in unforced contact with it, form a natural unity with it, and so occupy the same natural place as it. Thus it must have a natural place of its own, which, because of its distinctive differentiae, is between that of water and fire. If, on the other hand, air is in forced contact with, for example, fire, the two will be transformed into a single element, whose identity depends on which differentia in air masters the contrary differentia in fire, or vice versa, it will then have a natural place of its own. While this discussion does not resolve any of the puzzles listed at IV 1 209^{a}2–30, it does show that the account of place is in accord with the "things believed about place," and so meets another of the conditions that an adequate account of place must satisfy. See IV 4 210^{b}32–211^{a}11n.

If they are naturally unified (*sumpephukota*) **they cannot affect each other:** "It is because it has in it a certain starting-point (and the matter too is a certain starting-point) that what is affected is affected, and that one thing is affected by another. For what is oily is burnable, what yields in this specific way is crushable, and similarly in the other cases. The other capacity, by contrast, is in what acts—for example, heat or the craft of building (the one in what is capable of heating, the other in what is capable of building). That is why insofar as it is naturally unified (*sumpephuken*) nothing is affected as a result of itself, since it is one, and not other" (*Met.*

IX 1 1046^{a}22–29). Thus, when a doctor treats himself, he does so insofar as he is other. This involves his having in himself two distinct starting-points. One is the craft knowledge of medicine that he has in his understanding, which is the starting-point of his active capacity to produce curative movements in a diseased body (VII 7 1032^{a}32–^{b}14), and the other is the diseased condition in his body, which makes him a suitable case for medical treatment. Natural unity, we may infer, precludes the sort of complexity that having two such starting-points would require. On natural unity, see *Ph.* V 3 227^{a}23–32, *Met.* XI 12 1069^{a}5–14, XII 3 1070^{a}10–11.

Note 396

It is in this way too that air is related to water, since the one is as it were (*hoion*) matter, the other form—water is the matter of air, while air is as it were (*hoion*) a sort of (*ti*) activation of water, since water is potentially air, whereas air is potentially water in another way: The defining differentiae of the elements come in pairs of contrary capacities, one of which is active or productive, the other passive. Transformation occurs when the active capacity in one element "masters" the contrary passive capacity in an adjacent element: "We must describe the operations of the productive potentialities and the forms taken by the passive ones. First, unconditional coming to be in general and natural change and the corresponding natural passing away are the function of these productive potentialities; and these processes occur in plants, animals, and their parts. Unconditional natural coming to be is a change produced by these potentialities, when present in the right ratio, in the underlying matter of a natural thing, and this is determined by the passive potentialities we mentioned. The hot and the cold cause the thing to come to be when they master the matter" (*Mete.* IV 1 378^{b}26–379^{a}1). The fundamental form of such mastery is concoction (*pepsis*), which is responsible for producing a uniform stuff, and for preserving its nature thereafter: "Concoction is a completion effected by a thing's own natural heat from the corresponding passive potentialities, these being definitive of the matter proper to the thing. For when a thing has been concocted it has been completed and brought into being. Moreover, the starting-point of the completion is its own proper heat. . . . The end of the process of concoction is the thing's nature—but nature in the sense of form, that is, substance. . . . Concoction, then, is what everything undergoes when its matter—that is, its moisture—is mastered; for this is what is given definition by the thing's natural heat, and as long as the defining ratio exists in it, it possesses its nature" (*Mete.* IV 2 379^{b}18–35). Natural heat is thus *formative* heat—the principle in nature partly responsible for the coming to be and preservation of matter-form compounds. When water is transformed into air, then, what happens is that its natural formative heat increases. This is what makes it appropriate to claim that air is *as it were a sort of* activation or activity of water, since form is activity or actuality and matter potentiality (*Ph.* II 1 193^{b}7–8). When air is transformed into water, on the other hand, formative heat is lost, so that it is transformed into water "in another way."

Note 397

We must, however, make determinations about these topics later: At *GC* I 3.
Non-perspicuous . . . more perspicuous: See I 1 184^{a}19n.

Note 398
The being for them is not the same: See I 2 185^{b}22n.

Note 399
Those, then, who try to show that a void does not exist . . . as Anaxagoras does and those who try to refute it in this way: = DK A68 = TEGP 23.
But what they in error say about it: Rejecting with P the OCT addition of ὅ.

Note 400
Showing how strong the air is, and by trapping it in clepsydras: A clepsydra is a water clock in which time is measured by water dripping slowly from a small opening at the bottom when the top is opened. But when water is instead allowed to enter and then the top is closed, it also functioned as a pipette or syphon, which is how it is functioning here. See also *Cael.* II 13 294^{b}15–21, *Prob.* XVI 8.

Note 401
Together (*hama*): In its temporal sense, the adverb *hama* means (1) "at the same time," or "simultaneously." But it also means (2) "together," or "at once," without direct reference to time. Its meaning in contexts like this seems to be a mixture of (1) and (2).

Note 402
Wine-jars will be receptive of the wine along with the wineskins: The idea seems to be this. Wine consists of atoms and voids. When it is poured from the wineskins in which it is transported into the wine-jars in which it is stored, it is compacted by the greater mass of wine in the wine-jar, so that previous voids are now filled with atoms. Since there are now more voids than before, these can be filled by the (mix of voids and atoms) in the wineskins. Compare *Pr.* XXV 8 938^{b}14–24.

Note 403
The [vessel] that surrounds ashes is receptive of as much water as the empty vessel: See *Pr.* XXV 8 938^{b}24–939^{a}9.

Note 404
This happens first in the case of the numbers: Because "numbers were primary in the whole of nature," and so "they took the elements of numbers to be the elements of all beings" (*Met.* I 5 986^{a}1–2). See also *Ph.* III 4 203^{a}10–15n.

Note 405
By deduction (*ek sullogismou*): See I 3 186^{a}6n.

Note 406
Whatever has heaviness and lightness: Reading τὸ βάρος ἔχον καὶ κουφότητα with P for OCT τὸ βάρος ἔχον ἢ κουφότητα ("whatever has heaviness or lightness").

Note 407
We have discussed place: At IV 1–5.
A void does not exist as a place lacking body, whether separated or unseparated: A separated void is one "actively existing" (IV 6 213^{a}32–33) without a

body in it; an un-separated one is one that has a body in it, but could not have one in it, and so exists potentially.

Un-separated (*achôriston*): Because of the contrast with "separated (*kechôrismenon*)," *achôriston* here seems to have the meaning of a perfect passive participle ("un-separated") rather than to express possibility ("inseparable"). See I 2 185^{a}31n.

Note 408

Undergo alteration (*alloiousthai*): See I 3 186^{a}18n. The following passage makes it clear, however, that though air is condensed in volume when it becomes water, as water increases in volume when it becomes air, these changes in volume need to be distinguished from increase and decrease proper: "But then neither is it possible for us to say that increase or decrease occurs in the way in which, for example, air comes to be from water. For although the volume has then become greater, this will be not increase but the coming to be of that which the change is to, and passing away of the contrary. . . . For our account of increase must preserve the characteristics of what increases or decreases. And these are three: [1] any and every part is larger (for example, if flesh increases or grows, any and every part of the flesh); [2] by the addition of something; and [3] in such a way that the increasing thing is preserved and remains" (*GC* I 5 321^{a}9–29).

Note 409

When air comes to be from water: See I 4 188^{a}16–17n.

Note 410

The argument about increase [= A] . . . [is] self-impeding, since either [1] not any and every [part] increases; [2] it does so not by [the addition of] body; [3] it is possible for two bodies to be in the same [place]; or [4] it is necessary for the whole body to be a void, if it increases at every point and increases by means of a void: The argument is intended to show that a void exists by appealing to the phenomenon of the increase in size of bodies. [1*] Suppose B_1 is a body that increases by the addition of a body B_2 and that P_x is any random bodily part of B_1. Ask: Does P_x increase by addition of some body B_p that is a bodily part of B_2? If the answer is yes, then, since P_x can be arbitrarily small, it must not simply have a void in it, it must have a void that is equal in volume to B_p. But B_1 is a sum of bodily parts like P_x, each of which can increase by the addition of a body, so B must also be a void. Thus if [1*] is not denied, [A] is self-impeding, since it entails that there are no bodies to increase in size, but only voids. [1] denies [1*] by denying that every part of B_1 can increase. So let P_x be an arbitrary bodily part that can increase and P_y an arbitrary bodily part that cannot increase. B will then be the sum of bodily parts like P_x and those like P_y. Consider now the bodily part P_z that consists of all the parts of B_1 that are like P_y. Since P_z is (or is when separated from B_1) a body, it follows that some bodies are voids, and some voids bodies. Since the distinction between bodies and voids has once again collapsed, [A] is again self-impeding. (It is true that Aristotle thinks that "it is evident that any and every part of what is increasing has increased" (*GC* I 5 321^{a}2–3). So he could object to [1] on so to speak factual grounds. But that would hardly show that [A] was *self*-impeding.) [2]

Does P_x then increase not by the addition of body? Well, the only thing that atomist defenders of the void have in their ontology besides atoms are voids, so P_x must increase by the addition not of B_p but of a void V_p. The difference between bodies and voids is thus again elided, since some things can increase by the addition of bodies, others by the addition of voids. The next alternative is [3], P does increase by the addition of B_P, but P and B_P are coincident. But if bodies can be coincident, then voids are unnecessary. This leaves the obviously absurd [4]. Thus on all four options [A] is self-impeding, and so is self-impeding *sans phrase*.

Note 411

They are requiring that we resolve a puzzle common to both sides, then, not showing that a void exists: The two sides are atomists such as Melissus who attempt to show that a void exists and Aristotle as their opponent. The puzzle common to both is to account for the phenomenon of increase in size: it is discussed at *GC* I 5 321^{a}2–322^{a}33.

Note 412

If each of the simple bodies has by nature a certain spatial movement (for example, fire upward and earth downward or toward the center), it is clear that a void would not be the cause of their spatial movement: The thought seems to be that a void could not cause movement in two contrary directions.

Note 413

In what way will something be in either a place or a void? For it does not result [as the defenders of the void suppose] when some whole is put in a separated place, that is (*kai*), in some body that remains: Reading σώματι with P and the mss. for σῶμα τι ("it does not result [as the defenders of the void suppose] when some body is put as a whole in a separated place that remains there"). The idea (not entirely clear on either reading) seems to be this. A separated place P_s is like a body B. So suppose B occupies P as some whole W is supposed to occupy a part P_x of P_s. Unless a part of B is put into it separately, it will not be in a part of P, but in P as a whole (that is, in B, which occupies P). Therefore, by the same argument, W will not, as hypothesized, be in P_x. See also IV 4 211^{b}19–29, 8 216^{a}26–^{b}21.

Note 414

A part of it, if not put in separately, will not be in a place but in the whole [body]: See IV 4 211^{a}29–^{b}1.

Note 415

Whether because of reciprocal replacement (*antiperistasin*), as some people say: Probably a reference to Plato: "When, conversely, the fire is expelled [from a body], then, since the fire does not pass into a void, propulsion is exerted upon the surrounding air, which in turn compresses the still mobile liquid volume into the places previously occupied by the fire and mixes with it itself" (*Ti.* 59a).

Or because the air that has been propelled propels them with a movement that is faster than the spatial movement by which what is propelled spatially moves to its proper place: See VIII 10 266^{b}27–267^{a}12.

Note 416

Nor can anything be moved in a void except in the way that what is carried is moved: For example, as a passenger is carried on a ship. For a projectile must, on either of the views just canvassed, be connected by the medium (air, water) to what propelled it.

Note 417

As things stand something is thought to spatially move in a void because the void yields to it, but in a void such yielding is everywhere alike, so that it will move in every way: Why does X move in direction D_1 rather than in D_2? (Supposed) atomist answer, because the void yields to X in direction D_1 but not in D_2. This makes sense if there is resistance to X's moving in D_2, caused by the presence of atoms in its path. But this explanation does not generalize to the case where X is in (surrounded by) a void. It is not clear, however, why the atomist cannot reply that in a void X continues to move in D_1 because D_1 is the direction of its impressed movement, and there is a void (no resistance) to its continuing to move in D_1.

Note 418

[5f]: In [5f-i] we have a single body in spatial movement through two different bodies, as [5f] requires; [5f-ii], by contrast, requires two bodies of different weights, and so is strictly speaking inconsistent with [5f], although Aristotle's (carelessly expressed) meaning is clear enough.

We see (*horômen*) **that the same weight and body spatially move faster due to two causes:** Compare IV 8 216^a13.

Weight (*baros*): When *baros* is contrasted with *kouphos* or *kouphotês* ("light," "lightness") it is translated as "heavy" or "heaviness," but when, as here, it applies to whatever has either heaviness or lightness it is translated as weight. It helps to think of the contrast, as Aristotle does, in terms of tendencies to move to proper places. If something naturally tends to move down toward the center it has some degree of heaviness; if it tends to move upward, away from the center, it has some degree of lightness.

Different with respect to excess (*huperochên*) **of heaviness or lightness:** Compare: "Heaviness (weight) is both what has any tendency of whatever degree to move downward and what has an excessive tendency to move downward, and speed is what has any amount of movement whatsoever and what has an excess of movement" (*Met.* X 1 1052^b28–30). See IV 8 216^a13n.

Note 419

If a line is not composed of points: As, in fact, it is not. For a line, which has magnitude or length, cannot be composed of points, since they have position but no magnitude. See *Met.* III 4 1001^b17–19, V 6 1016^b25–26.

Note 420

The assumption was that it would do so in G: See IV 8 215^b24.

Note 421

Balance-weight (*rhopê*): A's heaviness (weight) is its non-comparative tendency to move downward; its lightness, its non-comparative tendency to move upward: "By unconditionally light, then, we mean that which spatially moves upward or to the extremity, and by unconditionally heavy that which spatially moves downward or to the center. By light in relation to something else, or lighter, we mean that, of two bodies possessed of weight and of equal volume, the lighter one is the one that is exceeded by the other in the speed of its by nature downward movement" (*Cael.* IV 1 308^{a}29–33). A's balance-weight is its weight or lightness in comparison to B's, when A is in one pan of a (fair) balance or weighing-scale and B is in the other. If the A-pan moves downward, A has a greater balance-weight of heaviness than B, and a smaller balance-weight of lightness.

Note 422
This is the same as saying that a place is something separated; and that this is impossible was stated earlier: IV 4 211^{b}19–29.

Note 423
Even if this is also hot or cold, heavy or light, the being for it is nonetheless distinct from all its attributes, even if not separable [from them]—I mean the volume of the wooden cube: "There is . . . a matter from which corporeal substance itself comes to be, . . . this same matter is also the matter of magnitude and quality, though separable from these matters in account, but not separable in place, unless the attributes also are" (*GC* I 5 320^{b}22–25).

Note 424
Further . . . by touch: Secluded in OCT.

Note 425
Xuthus: Little is known about Xuthus, who may have been a Pythagorean from Croton, or an atomist, or a mix of the two.

Note 426
A place that has an extension within itself: See IV 8 216^{b}2–16.

Note 427
The same argument: See IV 8 215^{a}29–216^{a}11.

Note 428
Since we say . . . a straight line: Secluded by Hussey as a later intrusion.

Note 429
The change being sometimes to greatness from smallness, sometimes to smallness from greatness: See IV 7 214^{b}3n.

Note 430
What is convex has not come to be in anything that was not convex but straight, since it is not by there being intervals that there is less or more: When we shrink a circle, an arbitrary arc of the smaller one will have a greater degree of convexity than an arbitrary arc of the larger. But this is not because convex segments of the larger one contain straight intervals or gaps that are filled by convex segments in the smaller.

Note 431

Whiteness (*leukotês*): That is, brightness.

Note 432

{Further, just as the arc of a circle . . . the same matter}: This near doublet of IV 9 217^{b}2–7 is rightly secluded in OCT.

So too all cases that are by contraction and expansion of the same matter: Reading συναγωγῳ καὶ διαστολῇ with P and most mss. for OCT συναγωγὴ καὶ διαστολὴ.

Note 433

The heavy and the hard clash, however, in the case of lead and iron: Lead is heavy and soft; iron heavy and hard.

Note 434

It is evident that a void does not exist either [1] set apart—whether [1a] unconditionally or [1b] in the rare—or [2] potentially: A void of sort [1a] would, as set apart from all bodies, be outside the universe (IV 6 213^{b}1–2); a void of sort [1b] would exist in the form of gaps inside a body, making it rare (213^{a}33–34); a void of sort [2] is one that is occupied by a body, but is distinct from it.

Note 435

With respect to this contrariety: That is, heavy and light. See IV 8 215^{a}29–^{b}12 (= [5f-i]).

Of being affected and not being affected: Of being affected in the case of soft things, of not being affected in the case of hard ones.

Note 436

The external accounts (*tôn exôterikôn logôn*): *Exôterikoi logoi* are also mentioned at *Met.* XIII 1 1076^{a}28–29, *NE* I 13 1102^{a}26, VI 4 1140^{a}2, *EE* I 8 1217^{b}20, II 1 1218^{b}32, *Pol.* III 6 1278^{b}30, VII 1 1323^{a}21. *Cael.* I 9 279^{a}30 mentions "the philosophical works in circulation" and *DA* I 4 407^{b}29 "the common accounts." The references, apparently, are to popular works written by Aristotle himself and "in circulation" (*NE* I 5 1096^{a}3) outside the Lyceum, or to accounts or arguments, not necessarily developed by him, that are generally known. Whatever the precise reference here, it must be to accounts with which the audience of the *Physics* were familiar.

Note 437

The now (*to nun*): See VI 3 233^{b}33–35.

Note 438

A part is measured: Reading μετρεῖται with P and most mss. for OCT μετρεῖ τε ("a part measures [the whole]").

Note 439

It will be simultaneously in the nows in between them, which are unlimitedly many: Because "between points there is something intermediate" (*Met.* XI 12 1069^{a}13), so that between any two points, there is a third.

Note 440

Nothing that is divisible and limited has [only] one limit; . . . but the now is a limit, and it is possible to take a limited time: A limited time is bounded by two distinct nows, but if the now is the same on every occasion, then it cannot be.

Note 441

Some say that time is [1] the movement of the whole universe: Plato says that time is "the wandering of the heavenly bodies" (*Ti.* 39d), but also, more plausibly, that these wandering or planetary bodies "come to be in order to set limits to, and stand guard over, the numbers of time" (38c).

Others that it is [2] the sphere itself: The reference is unclear.

Note 442

If there were more than one heaven, the movement of any whatsoever would equally be time, so that many distinct times would be together (*hama*): Suppose U_1, U_2, and U_3 are different universes, each revolving at different speeds. Let P be some temporal process and ask how long a time did P take? Measured by U_1, the answer is t_1, by U_2, t_2, and by U_3, t_3. Ex hypothesi, $t_1 \neq t_2 \neq t_3$. Yet since each measures P correctly, $t_1 = t_2 = t_3$, so that different (lengths of) time are together. If Aristotle's point were that U_1, U_2, and U_3 were distinct time series, they would apparently be temporally unrelated, not simultaneous (another meaning of *hama*).

Note 443

It makes no difference to us at present whether we speak of movement or of change: *Kinêsis* ("movement") and *metabolê* ("change") are distinguished at V 1 $225^a34–^b9$.

Note 444

The fabled sleepers among the heroes in Sardinia: Hero cults were common in ancient Greece, since heroes, a bit like Christian saints, were conceived of as beings with a special status, intermediate between gods and ordinary human beings. According to one account, sick people received a treatment in Sardinia that involved sleeping among the heroes there for five days, after which they awoke remembering nothing.

Note 445

What thing belonging to movement time is: Another option, unexplored by Aristotle, would be to ask what thing belonging to time movement is. In proceeding as he does, therefore, Aristotle implicitly takes movement to be more basic than time. This may be because of his beginning with our perception of time. For even though we perceive movement and time together, we perceive time because we perceive movement, not vice versa. See IV 11 $219^a23–25$.

Note 446

Time is not movement: Shown at IV 9 $218^b10–20$ (= [3]).

Note 447

The movement follows along with the magnitude: The magnitude is the one stretching from the start of the movement to its end. Since it is continuous, so is the movement along it.

Note 448

That thing, whatever it is, by being which movement is (*ho men pote on kinêsis estin*) **[what it is], but the being for it is distinct and not a movement:** Reading ἐστιν, which OCT secludes, and understanding the difficult phrase *ho men pote on kinêsis estin* in the way defended in Coope, pp. 173–177. The phrase then refers not to the being for, or essence of, movement but to the ground or basis of that essence. Phrases with similar constructions are found again at IV 11 219^b14–15, 18–19, 26, 220^a7–8, 14 223^a26–28, and without the participle *on* at 11 219^b10–11.

Note 449

We define it by grasping one [now] and then another: Reading αὐτό with P and the better mss. for OCT αὐτά.

Note 450

What is given definition by the now is believed to be (*dokei*) **time—and we may assume this:** See IV 4 210^b32–211^a11n.

Note 451

The same but belonging to something that is before and after: Now_1 belongs to the start of a movement, now_2 belongs to its end-point. But we consider $\mathrm{now}_1 = \mathrm{now}_2$ because we are thinking of the now as being the same on all occasions (IV 10 218^a9–10 = [P3a]).

Note 452

Movement insofar as (*hê[i]*) **it has a number:** Or "that qua which movement has a number."

Note 453

All simultaneous time is the same: That is, the time of event E_1 and that of E_2 are the same if E_1 and E_2 are simultaneous. Aristotle is not suggesting that there can be distinct times that are simultaneous.

Note 454

For the now (whichever now it is) is the same, though the being for it is distinct: The claim is not that the being for an earlier now N_1 is distinct from the being for a later now N_2. For N_1 and N_2 are themselves distinct, whereas an entity E_1 is typically distinct in being from E_2 when E_1 and E_2 are numerically identical, but are regarded in different ways. Thus "the hill up and the hill down [are one and the same], although the being for them is not one" (*Met.* XI 9 1066^a33–34). What Aristotle presumably has in mind, then, is this. Suppose that M_1, M_2, and M_3 are distinct movements whose starting-points are simultaneous, and suppose that time N_1, N_2, and N_3 are the nows that give them definition, or mark them off, at that end. Then, since simultaneous nows are identical (*Ph.* IV 11 219^b10),

$N_1 = N_2 = N_3$, but they differ in being, because N_1 marks the start of M_1, not that of M_2 or M_3, and so on.

Note 455

And the now measures time, insofar as it is before and after: Reading τὸ δὲ νῦν τὸν χρόνον μετρεῖ, ᾗ πρότερον καὶ ὕστερον ὁρίζει with P and (in the case of μετρεῖ) the mss. for OCT τὸ δὲ νῦν τὸν χρόνον ὁρίζει, ᾗ πρότερον καὶ ὕστερον (“the now gives definition to time, insofar as it is before and after”).

Note 456

As we said, movement follows along with magnitude: At IV 11 219^{a}11–12.

Note 457

As in the case of the point, so in the case of the thing in spatial movement by which we come to know movement and the before and after in it: “A moving line makes a surface, and a moving point a line” (*DA* I 4 409^{a}4–5). This view, attributed to Speusippus (F52 Tarán), is not one Aristotle shares: geometrical points cannot move, since they are defined by their position. But it usefully allows him to bring together the points on a line with the moving object that is at those points at distinct times.

Note 458

What is in spatial movement (*to pheromenon*), **in respect of that thing (whatever it is) by being which it is [what it is], is the same (whether a point, a stone, or something else of this sort):** O_1 is the moving object en route from point P_1 to P_2 (≈ Coriscus-in-the-Lyceum). O_2 is the thing (≈ Coriscus) that, while it is in fact en route from P_1 to P_2, could just as well be at rest. O_2 is that by being which O_1 is what it is. Thus considered in respect of it, $O_1 = O_2$.
But in account it is distinct: For a difference in account signals a difference between the being for O_1 and that for O_2. See IV 11 219^{b}11n.
Just as the sophists take Coriscus-in-the-Lyceum and Coriscus-in-the-marketplace to be distinct: “The arguments of the sophists are above (one might almost say) all else concerned with the coincidental—for example, whether musical and grammatical, or musical Coriscus and Coriscus, are distinct or the same” (*Met.* VI 2 1026^{b}15–18). For example, in claiming that musical Coriscus ≠ Coriscus, they treat the coincidental attribute musical as if it were an essential one, by failing to distinguish between a substance (Coriscus) and a coincidental unity (musical-Coriscus). What we must do, however, is understand the moving object A_1 in the way that the sophists understand Coriscus-in-the-Lyceum, even though they in fact misunderstand the latter. Thus we should take O_1 (in contrast with O_2) as something that cannot exist without being in movement, as is suggested by *Ph.* IV 11 220^{a}1–2.

Note 459

And it is this (*tout’*) **that is most knowable:** The reference is to “that thing (whatever it is) by being which the now is [what it is],” in other words, to the object in spatial movement which, as a substance (a this something), is most of all knowable.

Note 460

A this something: See I 7 190^{a}32n.

Note 461

The now is always the same, and in another way not the same, as in fact is what is in spatial movement: Considered as O_1 (IV 11 219^{b}18–19n) what is in spatial movement is always distinct on distinct occasions; considered as O_2 it is one and the same on each of them. Similarly with the now.

Note 462

For the number of the spatial movement is time, while the now corresponds to what is in spatial movement: M_1 and M_2 are spatial movements. If they are two distinct but contiguous stages in the same movement, rather than two wholly distinct movements, then they must be contiguous states in the movement of the same spatially-moving-object O_1. Similarly, if the time t_1 that M_1 takes is to be contiguous to the time t_2 that M_2 takes, then the now N_1 that marks the end of t_1 must be coincident with the now that marks the beginning of t_2, or vice versa. Thus N_1 unifies t_1 and t_2 in the way that O_1 unifies M_1 and M_2.

As a sort of (*hoion*) unit of a number: "What is said to be a measure is the primary thing by which each is known, and the measure of each thing is a one [or a unit], in length, in breadth, in depth, in weight, in speed" (*Met.* X 1 1052^{b}24–27); "People posit the unit as in every way indivisible. And in the other cases they imitate this sort of measure. For in the case of a stade [two hundred yards], a talent [six thousand drachmas], or anything comparably large, some addition or subtraction might more readily escape notice than in the case of something smaller. So the first [or primary] thing from which, as far as perception goes, that cannot happen, this is what everyone makes a measure, whether of liquids or of solids, weight or magnitude, and they think they know the quantity when they know it by means of this measure" (1053^{a}1–8). Thus a unit of time is something like a least discernible length of time, let's say a second. So seconds are the units in which the time taken by a spatial movement is measured. Thus to ask how long M_1 is, is to ask what number of seconds M_1 takes. And the way to determine that number is to tick off a second S_1 at the now at which one second has passed since the start of M_1, S_2 at the now at which one more second has passed, and so on, until at S_n a now is reached at which M_1 finishes. The length of M_1 is then n seconds. And the now, because of the role it plays in determining n, is *like* a unit of time.

Note 463

The movement (that is, the spatial movement) is one by virtue of what is in spatial movement, because it is one—and not because that thing (whatever it is), by being which it is [what it is], is one (since that might leave intervals), but rather because it is one in account: As before, the thing (whatever it is), by being which a spatially-moving-object O_1 is [what it is], is O_2, the object that in fact is in spatial movement M_1 but could be at rest. It isn't O_2 that makes M_1 one movement, since O_2 might alternately move and rest, leaving gaps or intervals in its movement, which would therefore (as having distinct starting- and stopping-points) be distinct movement. Instead it is O_1 that makes M_1 one movement. It does this, however, not by being one in number but by being one in account. For O_1 is a distinct thing on each occasion, just like the now (IV 11 219^{b}31–33). But of all these distinct things the account is "O_1-spatially-moving-from-place-P_1-to place-P_2," where P_1 and P_2 are coincident with the nows N_1 and N_2 that give definition to M_1 by being its starting- and stopping-points.

Note 464

When one takes it in this way, treating the one point as two, one must come to a stop, if the same point is going to be start and end: When we stop at a point and then start at that point, we treat it as two, which is why it can be both what joins the two segments and what divides them (IV 13 222^{a}10–20).

Note 465

The smallest number unconditionally is the two: Two is "the first plurality" (*Met.* X 6 1056^{b}26–27), and in that sense is the smallest number or plurality: "The one signifies the measure of some plurality, and the number signifies a measured plurality and a plurality of measures. That is why it is quite reasonable for the one not to be a number, since *the* measure is not measure*s*, on the contrary, what both the measure and the one are is a starting-point" (XIV 1 1088^{a}4–8).

Note 466

A sort (*tis*) of number: The distinction between (1) a number unconditionally and (2) a sort of number is that between (1) what we count countable things with and (2) the countable things (IV 11 219^{b}5–7), that is, between (1) abstract numbers and (2) concrete pluralities.

Note 467

Many or few: For example, many minutes, few years.

Note 468

It is the same time everywhere at once . . . because the present change is also one: The present change is a particular change whose starting-point is coincident with the present now. See IV 10 218^{b}3–5n, 218^{b}13.

But not the same time before and after, because the past change and the future change are distinct: The past change C_p is a particular change whose starting and ending points, which define the particular times coincident with them, are before the present change. The future change C_f is a particular change whose starting and ending points, which define the particular times coincident with them, are after the present change. Since C_p and C_f are distinct, because differently related to the present change, the times coincident with, and defined by, their starting-points must be distinct too.

Note 469

In the way that a movement can be one and the same again and again, so too can a time—for example, a year, a spring, or a fall: What recurs is the type or kind (year, spring, fall); what does not recur is the token or particular instance of the kind (1984, spring 1958, fall 2007).

Note 470

Time measures a movement A by defining some movement B that will measure out the whole: The movement B might be that made by the second hand of a certain watch. If A is measured by sixty such movements as B, then A is sixty seconds long.

For a movement to be in time is for both it and the existence of it (*einai autês*) **to be measured by time (for time at once measures the movement and the existence of the movement** (*autês to einai*): Not, notice, *einai* + dative (= being for, or essence of), but *einai* + genitive. Time measures the movement and how long it exists for.

It is clear, though, that for other things too: Reading δῆλον δὲ with P and the mss. for OCT δῆλον. The latter reading changes the structure of the argument to something like this: "Since time is a measure of movement . . . , it is clear that for other things too this is what it is to be in time: for their existence to be measured by time."

Note 471

For what is in time there must a certain time when that thing is too, and for what is in movement, there must be movement at that time: Things that are in time are essentially in time, because their being or essence involves a reference to a certain time when they are. Similarly, things like *to pheromenon* of IV 11 219^{b}17–220^{a}14 are essentially in movement, because their being involves a reference to the times that give them definition. Similarly, the being for a thing that is in place (a spatial thing, as we would say) involves a reference to place, since for it to exist is for it to exist somewhere.

Note 472

A thing is *affected* in some respect (*ti*) by time: See IV 13 222^{b}24–27.

Note 473

Time is intrinsically a cause rather of passing away: As, for example, in the case of an animal's natural life expectancy, which, as determined by its form or essence, is a formal cause: "What belongs to contraries is accidentally caused to pass away by the passing away of the contraries (for contraries do away with each other). But none of the contraries present in substances are caused to pass away coincidentally, since substance cannot be predicated of any underlying subject. And so it would be impossible for anything that has no contrary or in which its contrary is not present to be caused to pass away. For what would there be to cause it to pass away, if indeed things can only be caused to pass away by their contraries, and if such a contrary does not exist, whether generally or around there? Or is this in one way true and in another way not? For it is impossible for anything that has matter not to have a contrary somehow belonging to it" (*Long.* 3 461^{b}1–12); "We might get a theoretical grasp on the cause of all these facts [about length of life] as follows. We must grasp that a living being is by nature moist and hot, and life also has such a nature, whereas old age is cold and dry as is a dead body. For it is evident that things are this way. But the matter of the bodies of animals consists of these: the hot, the cold, the dry, and the moist. Thus as they grow old they must become dry, which is why the moisture in them must not be too easily dried" (*Long.* 5 466^{a}17–23); "Coming to be [for an animal] is its first participation—by means of heat (*en tô[i] thermo[i]*)—in nutritive soul; and life is the remaining of this participation. . . . Violent death or passing away occurs through the extinction or exhaustion of the heat (for passing away may occur through either of these causes), whereas natural death is the exhaustion of the heat coming about through length and completeness of time" (*Juv.* 24 479^{a}29–^{b}3).

Note 474
As was said in the previous discussion: At III 2 202^{a}4–5.

Note 475
The diagonal's being commensurable with the side: Since the diagonal of a rectangle is necessarily incommensurable with its sides (*Met.* V 13 1019^{b}24–26), the diagonal's being incommensurable is a non-being—a non-existent state of affairs—that cannot be otherwise.

Note 476
What measures the existence (*ousian*) **of them:** See IV 12 221^{a}9n.

Note 477
As has been said: At IV 11 220^{a}5.

Note 478
It is in a general way a limit of time: Reading ὅλως πέρας with P and most mss. for OCT πέρας.
The point remaining where it is: As a point on a spatial line does.

Note 479
It divides potentially, and insofar as it does so the now is always a distinct one, whereas insofar as it binds together it is always the same: Unlike a point p on a spatial line L, at which L can be actually divided into two disjoint line segments L_1 and L_2, a now N_1, which is coincident with time t_1 in a temporal series S, cannot actually divide S into two disjoint temporal series, since time cannot stop and start in the requisite way. Instead N_1 divides S potentially at t_1, into S_1 (times earlier than t_1) and S_2 (times later than t_1). But to do so it must be distinct from all the times in S_1 and all the times in S_2, and so from all the nows coincident with those times. The now that binds together S_1 and S_2, by contrast, must be coincident with a time t_x in S_1 and with a time t_y in S_2, and so must always be the same now, since coincident (or simultaneous) nows are identical. Think of t_x as the last point in S_1 and t_y as the first point in S_2, these must be coincident if S is to be a continuous time. See IV 11 219^{b}10–12n, 220^{a}3–4n.
It is not always the same point to the understanding, since it divides in distinct places on distinct occasions; but insofar as it is one, it is the same on all:

As in IV 11 219^{b}16–18n, we are to imagine a line as traced out by a moving point P_m, which at time t_1 is at a point p_1 on the line, at t_2 at p_2, and at t_x at p_x. P_m is the same throughout, whereas p_1, p_2, and p_x are all distinct points. But just as geometrical points cannot really move neither can the now, which is their temporal analogue.

Note 480

Their being is not the same: See I 2 185^{b}22n.

Note 481

This, then, is one way in which things are said to be now: That is when they exist or are occurring at this point in time—at this indivisible now (V 4 222^{b}8).

Note 482

Nor is the flood now: "There have been, and there will continue to be, numerous disasters that have destroyed human life in many ways. The most serious of these involve fire and water, while the lesser ones have numerous other causes" (Plato, *Ti.* 22c). Aristotle has a similar view about the emergence and destruction of crafts and sciences: "It is likely that each craft and each philosophy has often been developed as far as possible only to pass away again" (*Met.* XII 8 1074^{b}10–12; also *Cael.* I 4 270^{b}19–20, *Mete.* I 3 339^{b}27–29, *Pol.* VII 10 1329^{b}25–30).

Note 483

If there is no time that is not some time, every time will be limited: Since, as has been shown, what occurs sometime occurs at some limited temporal distance from *now*.

Note 484

If one and the same movement comes to be at some time: The same kind or type of movement can recur, but not the same particular or token movement. See IV 12 220^{b}6–14.

Note 485

The now is not the starting-point and end-point of the same thing, since otherwise contraries would hold of it at the same time and in the same respect: Suppose now N_1 is the starting-point of a temporal segment S_1 and also an end-point of S_1. If *starting-point of* S_1 and *end-point of* S_1 are (1) contraries and (2) both hold of N_1, then a contradiction results. But if time is circular, so that N_1 is a point on the circumference of a circle, (1) is not true. For, as Heraclitus points out, "the starting-point and end-point are shared in the circumference of a circle" (DK 22 B103 = TEGP 78 F48). Thus in accepting (1) as obvious, Aristotle is presupposing rather than showing that time is linear (or, equivalently, that temporal before or after is a linear relation that induces a linear order).

Note 486

Time will not give out, then, since it is always at a starting-point: See VIII 1 251^{b}19–23.

Note 487

And all change is from a former condition: μεταβολὴ δὲ πᾶσα φύσει ἐκστατικόν, which is a near doublet of ἐκστατικὸν γὰρ ἡ μεταβολὴ καθ’ αὐτήν at IV 13 222^{b}21, makes little sense here, and should probably be secluded, as proposed by Hussey.

Note 488

Some people called it the wisest of all things: Simonides Fr. 645 Campbell III. **Pythagorean Paron:** Otherwise unknown.

Note 489

As was said earlier: At IV 12 221^{b}1–3.

Note 490

Regular movement (*homalên kinêsin*): See IV 14 223^{b}20–21n.

Note 491

But [it might be objected] it is possible that now another thing has also moved, with time being the number of each of the two movements: The assumption is that for each different kind of thing there is a distinct kind of number. For when we count chickens we get one number, whereas if we count chicken legs, we get another number.

Note 492

A time that is both equal and together is the same time: Reading ὁ αὐτὸς γὰρ χρόνος καὶ εἷς ὁ ἴσος καὶ ἅμα with OCT; P reads with most mss. ὁ αὐτὸς γὰρ χρόνος καὶ εἷς ὁμοίως καὶ ἅμα (“a time that is both in the same way one and together is the same time”).

Note 493

If indeed it is the case both that its number is equal and [their limits] together: Reading ὁ ἀριθμὸς with P; OCT secludes.

Note 494

As we said: At IV 12 220^{b}23–24.

Note 495

[1] Neither alteration, nor increase, nor coming to be are regular (*homalês*), **whereas [2] spatial movement is:** The meaning of [1] is not that alteration, increase, or coming to be cannot be regular or smooth, since V 4 228^{b}18–21 tells us plainly that they can be. Nor is the meaning of [2] that all spatial movement is regular, since VIII 9 265^{b}11–14 tells us that only circular movement “admits of being regular,” whereas rectilinear spatial movement is never regular. Instead, the thought in [1] is that while alteration, increase, or coming to be can be regular, they are not naturally or intrinsically so, while the thought in [2] is that a sort of spatial movement (that in a circle) is naturally or intrinsically regular (notice *en autê[i] pephuken* at 265^{b}15). What makes a movement of any sort regular is discussed at V 4 228^{b}15–229^{a}6.

Note 496

Time is thought to be the movement of the sphere: That is, the sphere of the whole universe. See IV 10 218^{b}5–7.

Note 497

For [1] the measured thing appears to be nothing beyond the measure: Reading τὸ μετρούμενον for OCT τῷ μετρουμένῳ ("for beyond the measure nothing is evident in what is measured").

But [2] the whole universe involves a plurality of measures: In [1] Aristotle is explaining how people came falsely to think that time itself is a sort of circle: when they looked at the measured thing they saw nothing beyond the measure, namely, the circular spatial movement of the sphere (IV 14 223^{b}30–31). [2] is his diagnosis of where they went wrong. They should have looked at the other regular movements in the universe, which are equally good measures of time, then they would have seen that time cannot be identical to any one of them. On the methodological significance of [1] and [2], see IV 4 211^{a}5–11.

Note 498

Things are said to be the same if they do not differ by a differentia, but not if they do: "Things, though, are said to be the same in many ways. [1] One way is that we sometimes say they are the same with respect to number. [2] Another is if they are one both in account and in number—for example, you are said to be one with yourself both in form and in matter. [3] Further, if the account of their primary substance is one—for example, equal straight lines are the same, as are equal and equiangular quadrilaterals, although they are many; but in these equality constitutes oneness" (*Met.* X 3 1054^{a}32–^{b}3). Since [1] is contrasted with [2] being one both in number and in account, this is the sense, presumably, in which we say A is the same as B when A and B are coincidentally one (V 6 1015^{b}17–36). The sense relevant here is [3].

Book V

Note 499

Directly (*prôton*): *Prôton* also means "first" or "primary."

Note 500

224^{a}21–^{b}1: Compare *Met.* XI 11 1067^{b}1–9.

Note 501

It is clear, though, that the movement is in the wood: Reading δὲ with P and most mss. for OCT δή ("it is clear, then, that the movement is in the wood").

Note 502

We stated earlier what movement is: At III 1 201^{a}10–11.

Note 503

Scientific knowledge: VII 3 247^{b}1–13 explains why scientific knowledge is immovable.
Heat: "It is not heat that is a movement but heating" (*Met.* XI 11 1067^{b}11–12).

Note 504

But then there will be change to a movement: Reading δὲ with P for OCT γὰρ ("for then there will be change to a movement").

Note 505

224^{a}11–16: Compare *Met.* XI 11 1067^{b}1–9.

Note 506

In what way in respect of something else and in what way by itself directly: See V 1 224^{a}27–28.

Note 507

Contraries: See I 2 184^{b}22n.

Contradictories: "Contradictories admit of no intermediate (for this is what a contradiction is, namely, an antithesis one or the other side of which must be present in anything whatever, not having any intermediate)" (*Met.* X 7 1057^{a}33–36).

Note 508

Induction: See I 2 185^{a}14n.

Note 509

224^{b}28–30: Compare *Met.* XI 11 1067^{b}12–14.

The intermediate is in a way the extremes: In particular "intermediates must be composed of (*ek*) the contraries" (*Met.* X 7 1057^{a}19), in the way, for example, that gray is composed of black and white.

Note 510

By "underlying subject" what is made clear by an affirmation: See V 1 225^{b}3–5n.

Note 511

There can be movement neither of what by combination or division (*to kata sunthesin ê diairesin*) is not: What is not *to kata sunthesin ê diairesin* is *to mê on to hôs pseudos* (*Met.* VI 4 1026^{a}35)—what is not in the sense of what is not true, or false (also V 7 1017^{a}31, IX 10 1051^{b}1, XIV 2 1089^{a}28). What is not by combination is an untrue affirmative; what is not by division is an untrue negative.

What is unconditionally not a this (*tode*): That is, not a this something (I 7 190^{a}32n), a substance (I 2 185^{a}23n).

Note 512

There are these difficulties, then, with what is not being in movement: Reading τῷ κινεῖσθαι τὸ μὴ ὄν with Barnes and some mss.

Note 513

Underlying subjects . . . may be made clear by an affirmation (the naked, toothless, or black): In other words, to say what toothless is we refer to the affirmation (or positive notion) of having teeth, since toothless = lack of teeth. Similarly, naked = lack of clothes, and black = the lack of white. See also *Met.* XII 4 1070^{b}18–21.

225^{a}3–225^{b}9: Compare *Met.* XI 11 1067^{b}14–1068^{a}7.

Note 514

If the categories are distinguished as being substance, quality, place, time, relation, quantity, and affecting or being affected: Retaining καὶ τῷ ποτὲ ("time"), which OCT secludes. Affecting (*poiein*) and being affected (*paschein*), which seem to be treated as a single category here (as at V 2 226^{a}4, *Met.* V 7 1017^{a}26, XI 12 1068^{a}9), and are referred to simply as movement (*kinêsis*) at *Met.* VII 4 1029^{b}25, X 2 1054^{a}6, XII 1 1069^{a}22, *EE* I 8 1217^{b}33, appear as separate categories at *Cat.* 4 1^{b}27, *APo.* I 2 83^{a}22, ^{b}17, *Top.* I 9 103^{b}23, *Met.* V 6 1016^{b}7–8. See also I 1 184^{a}10n(7), 2 185^{a}21n.

Note 515

There is no contrary to substance among the beings: See I 6 189^{a}33n.

Note 516

Nor is there with respect to [the category of] relation: Reading τῷ with P and some mss. for OCT τοῦ.

For when one of the two relata changes it may not be true that the other changes at all: Rejecting with P the OCT addition of ἀληθεύεσθαι καὶ μή. Suppose that the relation is equality in height ($=_{h}$) and that the relata are A and B. At t_1 A $=_{h}$ B, at t_2 A$\neq_{h}$ B, not because A has moved or changed height but because B has grown. The real or intrinsic change, which is one of quantity, is in B not in the pair A, B, whose movement is coincidental, since that of A is coincidental.

Note 517

Or of any mover and any moved: Reading οὐδὲ παντός with P and the mss. for OCT οὐδὲ.

Note 518

Some other underlying subject might change from one change to some other species [of change], like a human does from sick to healthy: Rejecting with Ross the OCT seclusion of οἷον ἄνθρωπος ἐκ νόσου εἰς ὑγίειαν.

For example, the human from sickness to health: Reading οἷον ἄνθρωπος ἐκ νόσου εἰς ὑγίειαν; OCT transposes to V 2 225^{b}24–25.

Note 519

For this movement is a change from one species to another: Reading αὕτη with P and most mss. for OCT αὐτη and rejecting the addition of οἷον ἀνθρώπου ἐκ νόσου εἰς ὑγίειαν.

Note 520

Coming to be and passing away are also from something to something, except that these are to things opposed in one way, whereas the other—movement—is to things opposed in another way: Movement is change from one contrary to another; coming to be and passing away are from one contradictory to another. See V 1 225^{a}12–20.

Note 521

It is clear, then, that if it has become sick, it will have changed to whatever the other sort of change may be (since it may remain at rest): The parenthetical remark acknowledges that there may be a moment of rest between becoming sick and becoming healthy, when one simply *is* sick.

Note 522

Now to scientific knowledge, now to health: Reading ὑγίειαν with P and the mss. for OCT ἄγνοιαν ("now to scientific knowledge, now to ignorance"). The change is intended to be a coincidental one.

Note 523

What simply comes to be something was not yet there, but there was already something that was coming to be coming to be something: B_s is a simple coming to be. B_c is a non-simple or complex coming to be—one that is coming to be something that might itself be coming to be. If at time t B_s is coming to be, then B_c is also coming to be at t. For something must be becoming B_s at t, and that something must, therefore, be a non-simple coming to be, namely, B_{c-1}. But B_{c-1} was also coming to be at t, so there must be a B_{c-2} that was coming to be B_{c-1}. And so on.

Note 524

For it must be the movement or coming to be *of* something *from* something *to* something: Reading τι with P; OCT secludes.

Note 525

225^{b}10–226^{a}16: Compare *Met.* XI 12 1068^{a}8–^{b}15.

Note 526

If there are three kinds of movement, then the underlying nature and that to which it proceeds must be one or other of these: The underlying nature in the case of the movement of a movement must itself be a movement, and so both it and the movement it is moving toward, and will have when it reaches it, must belong to one or other of the three kinds of movement that are argued to be the only kinds in V 1, namely, spatial movement, alteration, and increase and decrease (225^{b}5–9). As a result, a spatial movement must be in spatial movement or altering (or increasing and decreasing). But this is absurd.

Note 527

Coincidental change we set aside just now: At V 1 224^{b}26–27.

Note 528

226^{a}23–29: Compare *Met.* XI 12 1068^{b}15–20.

By quality I mean not what is in the substance: That is, in the essence. See I 2 185^{a}23n.

For even the differentia is a quality: "What is said in one way to be a quality is a differentia of substance. For example, human is animal qualified in a certain way because two-footed, horse because four-footed" (*Met.* V 1020^{a}33–34). Change with respect to a differentia would be either a coming to be or a passing away.

Note 529

The more and the less (*to mallon kai hêtton*): Corresponding to our notion of degree, and so connected to the notion of increasing and decreasing—tightening and loosening (*epiteinein kai aniêsin*). Thus as a musician tightens or loosens his instrument's strings until a certain target note is struck (*Pol.* IV 3 1290^{a}22–29), so too with vocal cords, sinews, and other string-like things (*GA* V 7 787^{b}10–24). Hence Aristotle employs the notion of tightening and loosening wherever a certain tripartite structure is thought to exist, consisting of a continuous underlying subject (*to mallon kai hêtton*), a pair of opposed attributes that can vary in degree, and a target, typically a mean condition of some sort, that can be achieved by tightening or loosening the underlying subject to change the degree of the attributes. As a result, he speaks of tightening and loosening in characterizing a wide range of phenomena, from the parts of animals to political constitutions (*Pol.* V 9 1309^{b}18–31, *Rh.* I 4 1360^{a}23–30). In the case of noses and other such parts, the continuous underlying subject is flesh and bone (or its shape), the pair of opposite attributes is hooked and snub, and the target—which lies somewhere in between the two, and so (as in political constitutions) in a mean of some sort—is being a straight nose, or at the very least a nose of some sort. In the case of colors, too, while many are constituted out of white and black in some definite ratio, others are constituted in "some incommensurable ratio of excess or deficiency," and so are apt for tightening and loosening (*Sens.* 3 439^{b}30). Because *to mallon kai hêtton* is found in many different genera, it cannot be the subject matter of any of the first-order sciences, since these are restricted to a single genus (*Rh.* I 2 1358^{a}10–17).
It is movement either from a contrary to a contrary: Reading ἐξ ἐναντίου εἰς ἐναντίον with P and most mss. for OCT ἐξ ἐναντίου ἢ εἰς ἐναντίον ("from a contrary or to a contrary").
Whether unconditionally or to some degree (*pê[i]*): Suppose A is maximally pale, or pale to degree m = P_m. Unconditionally speaking, the contrary of P_m is D_m—being dark to the maximal degree. But A can change not just to D_m, but also to P_x or D_x, some other degree of pale or dark distinct from P_m.

Note 530

226^{b}10–16: Compare *Met.* XI 12 1068^{b}20–25.

Note 531

226^{b}21–25: Compare *Met.* XI 12 1068^{b}26–30.
First place: See IV 2 209^{a}31–^{b}1.

Note 532

An intermediate is what a changing thing—if it changes continuously—arrives at prior to arriving at the ultimate thing to which, in accord with its nature, it is changing: It is noteworthy that this definition, like the one at *Met.* X 7 1057^{a}21–22, applies to changing things, not to things generally. A more general definition, applicable also to unchanging mathematical objects is given at *NE* II 6 1106^{a}29–30: "By 'the mean [intermediate] in relation to the thing,' I mean what is equidistant from each of its two extremes, which is precisely one in number and the same for all."

Note 533

Something is moving continuously if it leaves no intervals, or leaves the smallest interval, in the thing (*pragmatos*)—not in the time (for an interval in the time does not prevent this, and, on the other hand, immediately after the lowest note the highest note may sound), but the thing (*pragmatos*) in which the movement takes place: The *pragmatos* is the thing the movement is in, which may be a place or path (a circle) or an attribute that is in process of change (as at V 4 227^b25–26, 28). The movement may pause for an interval of time at a point on that path without being discontinuous in the sense required for the definition of intermediate (think of natural growth spurts). An interval or gap in the path itself, by contrast, makes the change discontinuous. By the same token, continuity of time is not enough for continuity of movement, as the example of the high and low notes shows. For these are contraries though there may be no temporal gap between one sounding and the other sounding.

Note 534

{227^a7–10}: Read after V 3 226^b23 with OCT.

Note 535

Natural assimilation (*prosphusei*): A sort of growing together (*sumphusis*) that can lead to the formation of a natural unity (V 3 227^a23–24, *Met.* V 4 1014^b20–26), but also to such things as Siamese twins: "Most monsters (*terata*) are due to embryos growing together" (*GA* IV 4 773^a3–4).

Note 536

If, as some people say, there is a point and a unit that exist separately: Pythagoreans and Platonists. See *Met.* XIII 13.

In points there is contact: A point is what has position and is indivisible in all dimensions (*Met.* V 6 1016^b25–26). A place is "the first thing encompassing each body" (*Ph.* IV 2 209^b1–2), and the "extremes" of a body are its surface envelope. Apparently, then, a point has neither place nor extremes, and so it is unclear, given the definition at V 3 226^b23, that points can make contact. Perhaps the idea is that points make contact when the distinct bodies they belong to make contact, or that when they are conceived of as things that exist separately (227^a27–28), they themselves behave like such bodies.

Note 537

226^b32–227^a31: Compare *Met.* XI 12 1068^b30–1069^a14.

It is possible for there to be something intermediate between points: This is a weaker claim than the corresponding one in *Met.* XI 12, which says flatly that "between points there is something intermediate" (1069^a13). If points can make contact, however, it is not just that there *is* nothing intermediate between those that do, there *can* be nothing intermediate between them. Perhaps, then, the idea is this. First, conceive of points P_1 and P_2 as existing separately, and so as

substance-like. Then even if P_1 and P_2 are in fact in contact, they can be separated, so that there can be something intermediate between them, such as a line. This makes the formulation in our text superior to the one in the *Metaphysics*. Notice too that if the definition of intermediate given at V 3 226^{b}23–27 is to be applicable to points, these must be conceived of as things that can change and move.
Between units there need not be, since there can be nothing intermediate between two and one: If two and one are conceived as separately existing, substance-like entities, they are relevantly like points that can be conceived as making contact. But because they are necessarily successive, nothing can be intermediate between them, since, unlike points, they are necessarily in contact.
All lines are intermediate between points: See VI 1 231^{b}9.

Note 538
We say that things are one in many ways: See I 2 185^{b}7–9n.

Note 539
The figures of predication (*schêmata tês katêgorias*): The figures of predication are the categories. See V 1 225^{b}5–9, also I 1 184^{a}10n(7), 2 185^{a}21n.

Note 540
Indivisible species: One that cannot be any further divided into sub-species.

Note 541
There are differentiae of color: The differentiae are what divide the genus into distinct species.
Turning dark (*melansis*) **and turning pale** (*leukansis*): These are movements. See V 1 224^{b}16–17.
Though at all events every turning pale will be the same in species with every other turning pale and every turning dark with every other turning dark: Reading πᾶσα οὖν λεύκανσις πάσῃ λευκάνσει ἡ αὐτὴ κατʼ εἶδος ἔσται καὶ πᾶσα μέλανσις μελάνσει; OCT secludes.

Note 542
Learning is in a way, but not unconditionally, one in species, if scientific knowledge is a species of supposition, and genus of the sciences: If X is learning science S_1 and Y is learning science S_2, they are in a way learning things that are one in species. For S_1 and S_2 are in a way one in species, since each is a species of supposition, which is the genus that scientific knowledge is in. But X and Y are not learning things that are unconditionally the same, since S_1 and S_2 are distinct sciences.
Supposition (*hupolêpsis*): *Hupolêpsis* is like belief (*doxa*), but unlike scientific knowledge, in that it can be false as well as true (*NE* VI 3 1139^{b}15–18). But whereas belief must be based on rational calculation (*Met.* IV 4 1008^{b}30–31), supposition need not be.

Note 543
There are three things that we speak of in connection with movement: [1] the thing, [2] what it is in, and [3] when: [1] and [3] are clear enough, both in

themselves and in light of Aristotle's examples. But [2] is somewhat less so. This is because it is intended to capture a feature common to all sorts of changes. So, for example, what a spatial movement is in is the spatial path (or place) traced out by the movement of [1] the moving thing. So it might, for example, be a circular one, or a rectilinear one. In the case of an alteration or qualitative change, however, such as the process of turning pale, what it is in—the analogue of the spatial path—is the quality itself (V 4 227^{b}26), or better the quality space, within which the process occurs. In the case of a color, this is the surface of the thing that is turning pale. See IV 3 210^{a}29–30n.

Note 544

If it is possible for what passed away to come to be again while remaining one in number: But this is not in fact possible.

Note 545

If [the states] are two, it follows because of this that the activities must also be two in number: Reading ὅτι εἰ [1] μὲν δύο, δι' αὐτὸ τοῦτο, ὡς τῷ ἀριθμῷ, καὶ τὰς [2] ἐνεργείας ἀνάγκη with OCT. Reading ἐνεργείας in place of the mss. ἕξεις ("states") at [2] requires taking [1] to refer to states. P retains the mss. reading, so that [1] refers to activities.

Note 546

It must be possible for what is one and the same to pass away and exist many times over: Which, as before, it is not.

Note 547

A movement that is unconditionally one must (if indeed every movement is divisible) be continuous: If every movement is divisible, then every sub-movement of it is divisible too. Since there is no limit to this process of division, every movement is continuous.

Note 548

Homonyms: See III 3 202^{a}28n. The homonym here is *extremity* as applied to walks and lines. Both have extremities, but these belong to distinct species, as is shown by the fact that they cannot make contact.

Note 549

Torch-race: A relay race in which torches served in place of batons. See Plato, *Rep.* 328^{a}1.

Note 550

What are continuous was posited to be those things whose extremities are one: At V 3 227^{a}10–12.

Note 551

There can be continuity only in virtue of the movements themselves being continuous: Reading συνεχὲς with P and the mss. for OCT συνεχῆς ("but the time is continuous only in virtue of the movements themselves being continuous"), which results in circularity.

Note 552

A movement is said to be one in a way distinct from those just mentioned when it is regular: See IV 14 223^b20–21n.

Note 553

An irregular movement seems in a way not to be one movement: "Every irregular spatial movement has an acceleration, top-speed, and deceleration. And the top-speed occurs either at the point from which a thing moves, at the point to which it moves, or at the mid-point—for example, perhaps for things spatially moving in accord with nature it is at the point to which they move, for those that move contrary to nature it is at the one from which they move, and for projectiles at the mid-point. Of spatial movement in a circle, on the other hand, there is no point from which, point to which, or mid-point. For of it there is simply neither starting-point, limit-point, nor end-point. For in time it is eternal and in length joined in one and unbroken. So if there is no top-speed of its spatial movement, there will be no irregularity either. For irregularity comes about because of deceleration and acceleration" (*Cael.* II 4 288^a17–27).

Note 554

The more and less: See V 2 226^b7n.

Notes 555

A movement cannot be regular if its path is an irregular magnitude—for example, a broken line, a spiral, or any other magnitude that is not such that any random part fits on to any other random part: A straight line and a circle are regular in this sense, as is a cylindrical spiral, but this was first proved by Apollonius of Perga in the 3rd cent BC. A tapering spiral is not regular and neither is a broken line (that is, one that includes an angle).

Note 556

Sometimes, though, it lies neither in the place nor in the time nor in that to which: Reading ὁτὲ with P for OCT ᾑ and τῷ ποῦ ("in the place") with P and the mss. for OCT τῷ ὃ ("in the subject").

Note 557

Fast and slow are neither species nor differentiae of movement, because they follow along with all movements, [including] the ones that differ in species: If fast and slow were differentiae of, for example, spatial movement, the fact that X was fast or slow would entail that it was a spatial movement. But an alteration can also be fast or slow. Therefore, these cannot be differentiae.

Note 558

Heaviness and lightness, when they are toward the same thing, are not species or differentiae either: Earth is heavy, in that it has a natural tendency to move downward toward the center of the earth, fire is light, in that it has a natural tendency to move upward. These sorts of heaviness and lightness are differentiae of earth and fire respectively. See III 5 205^{a}10–12n. But if the comparison is between the tendencies of two pieces of earth (or two pieces of fire) to move in the same direction with different speeds, then heavy and light are neither species nor differentiae of movement.

Note 559

What is less so always involves an admixture of the contrary: See I 5 188^{b}24–25n, V 2 226^{b}7n.

Admixture (*mixis*): Aristotle distinguishes between a mere combination (*sunthesis*) or mechanical mixture and a chemical one (*mixis*), which involves the formation of a new homogeneous stuff with new emergent attributes: "mixture (*mixis*) is unification of the mixables, resulting from their alteration" (*GC* I 10 328^{b}22).

Note 560

But if every movement that is one admits of being both regular and irregular, movements that are contiguous but not the same in species cannot be one and continuous. For how could a movement composed of an alteration and a spatial movement be regular? For if a movement is to be regular it must fit together: Suppose that M_1 and M_2 are contiguous movements that are distinct in species. The movement M_3 composed of M_1 and M_2, if it is to be one movement, must admit of being both regular and irregular (for example, in speed). But M_3 cannot be regular, since M_1 and M_2, belonging to different species as they do, cannot fit together. Therefore, M_3 cannot be one continuous movement.

Note 561

The same way with rest: See V 6.

Note 562

The being for them is not the same: See IV 11 219^{b}11n.

Note 563

About this we shall speak later: At V 5 229^{b}14–21.

Note 564

Becoming sick (*nosansis*): Coined by analogy with *hugiansis* ("convalescing," "becoming healthy").

Note 565

We are left, then, with [3] movements to contraries and [5] movements from contraries to their contraries: In fact, [1] from the same thing to the same thing also remains. It is discussed at V 5 229^{b}11–14.

Note 566

Learning (*manthanein*) **. . . scientific knowledge**: "Certain animals share naturally in some learning and teaching, some from each other, some from humans, these are the ones that have hearing—not just those that hear sounds but those that further perceive the differences between signs" (*HA* IX 1 608^{a}17–21; also

Pol. I 2 $1253^{a}1$–18, *Po.* 19 $1456^{b}5$–7). In the full sense, then, teaching and learning are linguistic activities that involve giving or acquiring formal instruction in a craft or science: "Teaching is argument (*logos*) based on scientific knowledge" (*Rh.* I 1 $1355^{a}26$); "It is from things already known, however, that all teaching proceeds, . . . since some is through induction and some by deduction" (*NE* VI 3 $1139^{b}26$–28).

Note 567

Upward spatial movement and downward spatial movement (for these seem to be contraries with respect to length): "It is evident that in some animals, at any rate, all such parts—I mean, for example, the right and the left—are seen to be present, and in others some of them, while in plants only the up and the down are present. Now if we must ascribe some such parts to the heaven as well, it is reasonable that the first one that . . . is present in animals is also present. For each pair, of which there are three, is a sort of starting-point. I mean by the three, the up and the down, the front and its opposite, and the right and the left. For it is reasonable that these extensions all belong to complete bodies. And the up is a starting-point of length, the right of breadth, and the front of depth" (*Cael.* II 2 $284^{b}15$–25). See also III 5 $205^{a}10$–11n.

Note 568

What is only *to* a contrary, it is not a movement but a change—for example, becoming pale but not from something: The case is not one in which the change is not in fact from a contrary, since one can only become pale from having not been pale, but rather one in which only the contrary to which it is changing is mentioned.

Note 569

That is why coming to be is contrary to passing away: See V 1 $225^{a}15$–20.

Note 570

In relation to each contrary the mean is said to be in a way the other contrary, as was said earlier: At V 1 $224^{b}30$–35.

Note 571

The lack of something too is in a way said to be its contrary: See I 7 $190^{b}27$n.

Note 572

Movement involves two underlying subjects: Which are either contraries or intermediates. See VI 1 $225^{b}1$–5.

Note 573

These two are also contrary to each other: That is, remaining at rest at one contrary and remaining at rest at the other.

Note 574

Of which there are contrary changes: Reading ὧν with P for OCT τούτων.
There is no remaining as or where they are: Reading καὶ with P for OCT καὶ μονὴ.

Note 575

The rapid ripening of seeds, even when not closed up: A reference, presumably, to seed forced to ripen by, for example, being kept closed up in the warm indoors.

Note 576

One passing away will be contrary to another . . . insofar as one is of *this* sort and the other of *that* sort: For example, insofar as one is pleasant, the other painful, or one in accord with nature, the other contrary to it.

Note 577

Without coming to be at rest, therefore, it will be at rest: As a clod of earth E_1 gets closer to its proper stopping place at the center of the universe (III 5 205^{a}10n), it seems to speed up. A clod of earth E_2, however, that is moving upward by force, does seem to slow down as it comes to a stop up above. Speeding up is not a process of coming to a stop, whereas slowing down is. Therefore, E_1 stops and is at rest without coming to a stop, whereas E_2 comes to a stop.

Note 578

Being at rest (*êremêsis*): *Êremêsis*, which often means "coming to rest," as at V 6 230^{a}4 and VI 7 238^{a}18, is here equivalent in meaning to *êremia* at V 6 230^{b}30.

Note 579

One might also raise a question, however, about coming to a stop . . . a movement is also opposed in a way to a state of rest: This paragraph follows what is clearly intended to be the closing sentence of the chapter and book and is largely superfluous. It is missing in some mss. and secluded in OCT.

Book VI

Note 580

If continuity, making contact, and successive are defined as above: At V 3 227^{a}10–13 (continuous), 226^{b}23 (making contact), 226^{b}34–227^{a}1 (successive).

Note 581

The argument just stated: At VI 1 231^{a}26–29.

Note 582

If someone is taking a walk to Thebes: Reading τις with P for OCT τι.

Note 583

Jumps (*kinêmata*): "Starts," "jerks," "impulses" are other possible translations.

Note 584

We have proven that it is impossible for anything that is continuous to be composed of indivisibles: In VI 1.

Which is just the way faster is defined by some thinkers: Namely, as traversing a greater in equal time, an equal in less, and a greater in less.

Note 585

In the same ratio: That of P_{1-3} to P_{1-2}.

Note 586

Conversion (*antistrephein*): *Antistrephein* is typically used to signify: (1) a logical relation between propositions, so that, for example, the universal negative converts, because if no B is A, then no A is B (*APr.* I 2 25^a5–6) and so on; (2) a logical relation between terms (I 45 51^a4–5), equivalent to counterpredication (*Top.* I 5 102^a19); (3) the substitution of one term for another, without logical convertibility (*APr.* II 15 64^a40); (4) the (valid) inference of (A admits of not being B) from (B admits of being A) (I 13 32^a30); (5) the substitution of the opposite of a premise for a premise (II 8 59^b4); (6) an argument in which from one premise in a syllogism, and the opposite of the conclusion, the opposite of the other premise is deduced (II 8–10, *Top.* VIII 14 163^a32–34). The sense here is perhaps closest to (3).

Note 587

If time is unlimited with respect to its extremities: That is, if it extends without limit in both directions.

Length too is so with respect to its extremities: Yet Aristotle seems to deny that length is unlimited in extension (III 5), while asserting that time is unlimited in this way (VIII 1, 2).

Note 588

Zeno's argument: See VI 9 239^b9–240^b7. The argument referred to here is described at 239^b11–13.

Note 589

BE will either measure AB exactly, fall short of it, or exceed it: That is, AB will be an exact multiple of BE, or the closest multiple m of BE to AB will be less or else greater than AB. BE = 3, AB = 16, m = 5 is a case of falling short (3×5 = 15); BE = 6, AB = 16, m = 3 is a case of exceeding (3×6 = 18).

Note 590

It will be divided into equal [parts] as the magnitude also is: Reading ὡς καὶ τὸ μέγεθος with P and the mss. for OCT καὶ τὸ μέγεθος.

Note 591

If the time is taken to be limited in one of the two directions: Reading ἐπὶ θάτερον with P for OCT ἐπὶ θάτερα.

Note 592

It is possible for it to traverse a length that is twice, or one and a half times, as great as that traversed by the slower: Reading ἐνδέχεται καὶ with P for OCT ἐνδέχεται δὲ καὶ.

Note 593
What is without parts will be traversed not in an indivisible but in a greater time: For example, the slower will traverse EF in a greater time than the indivisible one in which the faster traverses AB.

Note 594
The now too—said not with reference to something else, but intrinsic and primary: See IV 13 222^{a}10–20 (intrinsic and primary), 21–24 (with reference to something else).

Note 595
It, then, we have said, is a limit of both: Reading ἔφαμεν with P for OCT φαμεν ("we say"). See IV 13 222^{a}12.

Note 596
If it is shown to be such intrinsically: Reading καθ' αὑτὸ with P; OCT secludes.

Note 597
Synonymous: "Things are said to be *synonymous* when they have a name in common and when the account of the essence that corresponds to the name is the same—for example, both a human and an ox are animals. Each of these is called by a common name 'animal,' and the account of the essence is also the same, since if we are to give the account of what-it-is for each of them to be an animal, we will give the same account" (*Cat.* 1 1^{a}6–12).
Everything continuous is such that there is something synonymous intermediate between its limits: Thus an F (for example, a line) is continuous if between its limits there is an F (a line). See V 3 227^{a}11–17.

Note 598
All time has been shown to be indivisible: At VI 2 232^{b}19–233^{a}12.

Note 599
If the now is divisible, some part of the past will be in the future and some part of the future in the past: The part of the past that will be in the future is the part that falls on the future side of the point that (supposedly) divides the now into past and future; the part of the future that is in the past is the part that falls on its past side.

Note 600
The now would not be something intrinsic, but with reference to something else: Namely, the now that is intrinsic and indivisible. See IV 13 222^{a}21–24.
The division will not be intrinsic: The (supposedly) divisible now, which is an interval of time not a point or instant, will not divide itself, but will need the indivisible now to divide it. Moreover, it will not be a specific point (like the indivisible now), since it can be anywhere between the interval's extremes.

Note 601
The time is divisible at many points: The time = the interval of time occupied by the (supposedly) divisible now.

Note 602

What is at rest, we have said, is what naturally moves but is not in movement when, where, or in the way it would naturally be so: Reading ἐλέγομεν with P for OCT λέγομεν. See V 3 226^{b}12–16.

Note 603

It is not changing: Reading οὐ with P and the mss. for OCT οὔπω ("it is not yet changing").

Note 604

As we saw, a movement that is one cannot be the movement of more than one thing: The reference is unclear, but is perhaps to V 4 227^{b}20–228^{a}6.

Note 605

It is the same way if there is an excess [M_{z-w}] with respect to the division: If the movements of the parts of AC are assumed to exceed M_{1-3} by M_{z-w}, then M_{z-w} will once again be a movement of nothing.

Note 606

It is necessary for there to be the same divisions in . . . [2] the movement (*tou kinêseôs*), **[3] the being-in-movement** (*tou kinêsthai*): Since to each movement exactly one being-in-movement corresponds (VI 4 235^{a}30–31), the relation of [2] to [3] cannot be that of type to token, since one type can have many tokens. Instead, [3] seems to be the state of [4] the thing in movement when [2] the movement actually belongs to it, as opposed to its state before it begins the movement or after it has finished it.

Divisions . . . of quantity are intrinsic: Reading ποσοῦ with P and the majority of the mss. for OCT τόπου ("divisions of place"). On quantity, see I 2 185^{a}23n.

Note 607

Setting out (*ekthemenon*): The verb *ektithenai* (*ekthemenon* is a participle) means "expose," "exhibit," or "set out." In Aristotle's logic *ekthesis* is a way of confirming the truth of a third figure syllogism (P belongs to all S, R belongs to all S, P belongs to some R) by exhibiting or setting out a particular S (call it N). For N will be R and N will be P (*APr.* I 6 28^{a}10–30). The original home of *ekthesis*, though, is in a geometrical proof, where it refers to the stage at which an arbitrary instance is set out, assigned names, and drawn for the student to see ("Let ABC be a triangle in which the side AB = the side AC"). Aristotle employs the term in this sense at *APr.* I 41 49^{b}33–50^{a}4: "We must not think that something strange results from the setting out (*to ektithesthai*). For we make no use of the existence of the this something (*to tode ti*), but rather do just as the geometer does when he says that this line here (*tênde*) is a foot long, straight, and without breadth, when it is not, but does not use these things as something from which to deduce. . . . We use setting out just as we use perception, speaking to the student (*pros ton manthanonta legontes*); for we do not use it on the supposition that it is not possible to give a demonstration without these things, as it would be with the premises of a deductive argument."

Note 608
In the same way as we showed that the movement of a thing is divisible into the movements of its parts: At VI 4 234^{b}34–235^{a}8.

Note 609
The whole B_{1-3} will be continuous: Because it corresponds to M_{1-3}, which is continuous. See VI 4 235^{a}6–7.

Note 610
That divisibility does so was shown earlier: At VI 4 234^{b}10–20.
That unlimitedness does so will be made clear in what follows: At VI 7.

Note 611
One sort of change is with respect to a contradictory pair: Namely, coming to be and passing away. See V 1 225^{a}12–20.

Note 612
The others: Change of place, quantity, and quality.

Note 613
In something: That is, in the place or condition it has changed to.

Note 614
For B was not contiguous to be C, since the change is continuous: Reading γὰρ ("since") with P for OCT δὲ. If B and C are contiguous, they are successive and making contact (V 3 227^{a}6). A change to B is thus distinct from a change to C, since B and C are distinct. But the change to C was supposed to be one continuous change.

Note 615
So what has changed, at the moment when it has changed, is changing to what it is changing to. But this is impossible: Since the change to C is supposed to be continuous, it must end at C, so that it has changed when it reaches C. But it also ends when it reaches B, since a new change begins there. As a result at the moment it reaches B, and has ended, it is still changing to C, which is impossible.

Note 616
The primary time in which (*en hô[i] prôtô[i]*): Literally: "the primary in which." But the reference, as at V 1 224^{a}35, is to time, and not, as at VI 4 235^{a}16–17, to whatever the movement is with respect to.

Note 617
The argument is the same even if the thing is changing in one part and has changed in the other, since then there will be something prior to what is primary: Suppose the thing is changing in AB and has changed in BC. Then BC not AC is the time in which the thing has first changed.

Note 618
There is an end of change, and *it* we have shown to be indivisible because it is a limit: The end in question is the temporal end, which has just been shown to be

indivisible (VI 5 235^{b}30–236^{a}5), although no reference to its being a limit occurs there. An indivisible time, however, must be a now, and the now is an indivisible limit. See VI 3 233^{b}33–234^{a}24.

Note 619
There is no starting-point of a change nor a primary part of the time in which a thing started to change: Reading μετέβαλεν with P for OCT μετέβαλλεν ("was changing").

Note 620
Otherwise the nows: That is, the nows that are the limits of the interval BC.
Would be contiguous: Which is impossible. See IV 10 218^{a}18–19, VI 1 231^{b}6–10 (not successive entails not contiguous).

Note 621
If it has changed in one of the two: Reading εἰ δ᾽ with P and the mss. for OCT εἴτε.

Note 622
Every changing thing has been shown to be divisible: At VI 4 234^{b}10–20.

Note 622
In the half what has changed will be less than and so prior to DE: Reading ἔσται τὸ with P and most mss. for OCT ἔσται τι.

Note 624
The pale (*to leukon*): See I 3 186^{b}7n.

Note 625
Let AC be a magnitude, and let it have moved from A to a primary point B: Think of AC as a continuous line that has grown in length from A to C (and which point it has the magnitude in question), and suppose that it has done so by first reaching some point B. If AB is indivisible, A and B will both be indivisible, without parts, and contiguous—which is impossible. If AC is divisible, say at X, then AX not AC will be the first part of AB to achieve the magnitude in question, and so on.

Note 626
A thing without parts will be contiguous to a thing without parts: Which is impossible.

Note 627
It is evident, then, that only in movement with respect to quality can there be intrinsic indivisibility: "There are three sorts of movement—that of a quality, that of a quantity, and that with respect to place" (V 1 225^{b}7–9). Movement or change with respect to quantity or place are intrinsically divisible, since quantities and places are. Thus if any movement is intrinsically indivisible, it must be that with respect to quality. On which, see VIII 3 253^{b}23–30.

Note 628
This is clear even from the definition (for "primary" was meant in this way): At VI 5 235^{b}33–34.

Note 629

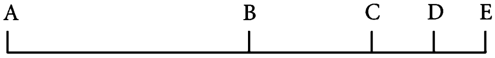
We have shown previously: At VI 5 235^{b}6–13.

Note 630

As we saw, nows are not contiguous: At IV 10 218^{a}18–19, V 1 231^{b}6–10 (not successive entails not contiguous).

Note 631

The division is without limit, just as in increasing and decreasing lines: Bisect a line AE at B, BD at C, and CE at D:



The result is an increasing series of lines (AB, AC, AD, . . .), each of which is longer than its predecessor, and a decreasing series (AB, BC, CD, . . .), each of which is shorter than its predecessor.

Note 632

It is also evident, then, that what has come to be must previously have been coming to be, and that what is coming to be must previously have come to be (that is, the ones that are divisible and continuous): The parenthetical clause is needed because there are things that "can come to be and pass away without going through a process of *coming* to be and *passing* away" (*Met.* VI 3 1027^{a}29–30). See VI 6 237^{b}9–11n.

Sometimes it is something else, for example, some part of it, like the foundation of a house: "All processes are incomplete in their parts (and during the corresponding time), which differ in form both from the whole process and from each other. For putting together the stones is different from fluting the column, and both of these are different from producing the temple. Also, the production of the temple is a complete production, since it lacks nothing as regards what was proposed. The production of the foundation and of the triglyph, though, are incomplete, since each is the production of a part. They differ in form, then, and it is not possible during any part of the time taken to find a process that is complete in form, but if indeed such a process is to be found, it is in the whole time taken" (*NE* X 4 1174^{a}21–29). Thus when we make a temporal cut in the process of building a temple or a house, what has come to be at that time will not be the temple or house but some part of it, such as the foundation or column.

Note 633

It is not always moving in the same movement and in some iteration of it: As in unlimited movement in a circle.

Note 634

And it is the same way with coming to rest: That is, a thing's coming to rest cannot cover a limited magnitude in an unlimited time.

Note 635

So it is impossible for one and the same thing to be always coming to be or always passing away: Think of a thing's coming to be as a movement along a limited extension, which would end, were it not always going on, with the thing's having come to be; think of its passing away as like its coming to rest along such an extension, which would end, were it not always going on, with the thing's having passed away. Since movements of this sort are impossible, so are the analogous comings to be and passings away.

Note 636

It is evident that neither can a limited magnitude traverse an unlimited magnitude in a limited time: Think of the limited magnitude as a unit that traverses by measuring out the unlimited one.

Note 637

If the unlimited one can traverse the limited one, the limited one must also traverse the unlimited one: Think of the unlimited magnitude as traversing by passing through the limited one, so that it is measured out by the latter, which could then traverse it by measuring it out.

Note 638

By taking the time, the demonstration will be the same: That is, by focusing on the time of the movement rather than the magnitude it traverses, the demonstration will parallel that at VI 7 238^{a}22–30.

Note 639

As we also argued previously in the case of what is in movement: At VI 6 236^{b}30–32.

Note 640

There is no movement in what is without parts: If the thing is moving in A, it has already moved in A (VI 6 236^{b}32–237^{a}17). Since nothing can both be moving and have moved at the same time, A must have parts.

Because part of it has to have moved: Reading τι αὐτοῦ with P for OCT τι ἂν αὐτοῦ.

What is coming to a stop has been shown to be in movement: At VI 8 238^{b}23–26.

Note 641

We have shown previously: At VI 8 238^{b}31–36.

Note 642

Something is at rest, we said: At V 2 226^{b}12–15.

Note 643

A thing is at rest when it is in the same state now as previously, as discerned not by one point but by at least two: Since all movement and change is from something to at least one other something.

Note 644

This can be shown in the same way as in the previous cases: That is, in the case of what is in movement (VI 6) and of being at rest (VI 8 238^{b}31–36).

Note 645

In that time in which it is moving intrinsically, not by doing so in some part of it: The time in question is the primary time of the movement (VI 8 239^{a}31). On which see VI 5 235^{b}30–34.

It is impossible for it then to be in movement with respect to some particular thing primarily: The thing in question is the extension that the moving thing is traversing, and so moving with respect to. The claim is that in the primary time of that thing's movement, there will be no part of that extension that is just large enough to contain that whole movement, neither more nor less.

Note 646

In a now it is always the same with respect to something that remains unchanged: Reading μένον with P and the mss. for OCT μὲν ὄν ("in a now it is always the same with respect to some particular thing").

Note 647

It is not in movement in a now and is so with respect to a particular thing, it cannot in an interval of time be so with respect to a thing at rest, since it then follows that what is in spatial movement is at rest: The thing under discussion is in movement with respect to a particular thing throughout an interval of time t, and so in all of its sub-intervals, although not in any of the nows in t. Thus if it were at rest with respect to a thing at rest in any of those sub-intervals, it would be both at rest and in movement.

It cannot in an interval of time be so with respect to a thing at rest: Reading τὸ ἠρεμοῦν with P for OCT τι ἠρεμοῦν.

Note 648

He says that if everything is always at rest when it is so with regard to what is equal [to itself]: That is, when the thing occupies its primary place, which is exactly the same size as the thing. See IV 4 211^{a}2.

Note 649

Zeno's arguments about movement, which present difficulties to those trying to resolve them (*luousin*): But this does not mean that we can use them to establish things in dialectical arguments: "We have at our disposal many contradoxical arguments that are difficult to refute—for example, Zeno's argument that it is not possible to move or to traverse the stadium. But one must not, because of this, refuse to accept their opposites" (*Top.* VIII 8 160^{b}6–10).

Note 650

We went through it previously: At VI 2 233^{a}21–31.

Note 651

Even the famously fastest runner will fail to catch the slowest one: The famously fastest being Achilles (for example, Homer, *Iliad* XXII.791–792), the famously slowest the tortoise.

Note 652

At the time it is a bit ahead it is not overtaken, nonetheless it is overtaken if indeed it is granted that it is possible to traverse the limited distance in question: Suppose that Achilles' speed is S_a, which is faster than the tortoise's speed S_t, and that the point at which the tortoise starts moving is 1. When Achilles reaches 1, Zeno shows that he is S_t/S_a behind, and that when he has traveled $1 + S_t/S_a$, he is S_t^2/S_a^2 behind, and so on. But he has not shown, and cannot show, is that when Achilles has traversed $S_a/S_a{-}S_b$ he is still behind, provided it is granted that this limited distance can be traversed in a limited time.

Note 653

The third, stated just now: At VI 9 239^{b}5–7.

Note 654

Bodies (*ogkôn*): An *ogkos* is generally a bulk, mass, or body, but the *ogkoi* to which Zeno is referring may be those of Empedocles, which were in particular *indivisible* bodies. Arguments [1] and [2] presuppose that magnitude is divisible; [3] and [4] that it is indivisible.

Note 655

All the Bs: Reading τὰ B; OCT secludes. The majority of mss. have τὰ A, while two have τὰ B. A defense of the majority reading is given in Heath, pp. 139–140.

Note 656

The falsehood mentioned: At VI 9 240^{a}1–4.

Note 657

Change to a contradictory: See V 1 225^{a}12–20.

Note 658

We say that a thing is white or not white not when the whole of it is such, but when most of its parts or its most-controlling (*kuriôtata*) **parts are:** "Some of these parts [of an animal], however, are simultaneous, namely, the ones that are controlling (*kuria*) and in which the account and the substance are first found—for example, the heart, perhaps, or the brain (for it makes no difference which of them is of this sort)" (*Met.* VII 10 1035^{b}25–27); "Nothing generates itself, but when it has come to be from that point on it causes itself to grow. That is why one part comes to be first and not all of them at the same time. And so the one that must first come to be is the one that has a starting-point of growth. (For whether they are plants or animal, this, the nutritive capacity, is present in all of them alike. But this is also the capacity of begetting another like itself. For this belongs to every animal and plant that is complete in its nature.) And it is necessary because of this that once something has come to be it must grow. Though it was generated, then, by something with the same name as itself, as human by human, it grows because of itself. Hence it is something (*ti*) since it makes itself grow. If, accordingly, it is one something (*hen ti*), and this the first [to be such], then this must come to be first. And so if the heart comes to be first in certain animals (or in those that have no heart the part analogous to it), it is from this (or from its analogue) that they would have their starting-point" (*GA* II 1 735^{a}14–26). In the case of white, the most-controlling part is the surface of what is said to be white, since this is its primary recipient, so that a thing is said to be white if its surface (or most of its surface) is white. See I 3 186^{a}30–31n.

Note 659

The circumference taken from point A is not the same as the one taken from point B, C, or from each of the other points: The whole circle ABCA is distinct in being from BCAB, and so on, so that it is not simply that the points on the circumference change places as the circle rotates, the circle as a whole does so, since it is in ABCA, then BCAB, and so on.

Other points (*sêmeiôn*): A *sêmeion* is usually a sign or indication, or a sort of rhetorical deduction (*Rh.* I 2 1357^{a}33). But here, as at *APo.* I 10 76^{b}5 and *Top.* VI 4 141^{b}12, it is a mathematical point (usually, *stigmê*).

Except in the way that the human and the musical human are the same: because they coincide: "And musical Coriscus is in a way one with just Coriscus, because a part of each coincides with one and the same thing. The case is similar if the coincident is said of the genus or of the names of something universal—for example, that a human and a musical human are [one and] the same. For it is either because the musical coincides with the human who is one substance or because each of the two coincide with some particular thing—for example, Coriscus" (*Met.* V 6 1015^{b}23–32). See also *Ph.* I 3 186^{b}7n.

Note 660

By "without parts" (*ameres*) I mean what is indivisible with respect to quantity. For even the intrinsic movements of the parts are distinct from the movements of the parts with respect to the whole: The idea, less than clearly expressed, is this. What is without parts can have no intrinsic movement simply because it is without parts. Like a part of a whole, however, it can have a coincidental movement by, for example, being in something that is moving, such as a boat. A part of a whole on the other hand has parts of its own (since all continuous things are divisible without limit) and so, unlike what is without parts, does also have an intrinsic movement, as is shown by the case of the revolving sphere.

Note 661

In the time in which it is changing it must be in AB or BC or partly in one and partly in the other, since this, as we saw, is true of everything that is changing: See VI 4 234^{b}10–17.

Note 662

As we saw, to be in the same state for an interval of time is to be at rest: At VI 8 239^{a}26–29.

Note 663
That this is impossible was already shown previously: At VI 6 237^{a}17–^{b}22.

Note 664
Jumps: See VI 1 232^{a}9n.

Note 665
It was shown previously that all time is divisible: At VI 2 232^{b}23–233^{a}10.

Note 666
There must be a certain time less than that in which the point itself has moved: Reading αὐτή with P for OCT αὐτήν.

Note 667
Alteration is always from certain contraries: See V 1 224^{b}30–35, 2 226^{b}1–8, 5 229^{b}14–20.

Note 668
Something is said to be incapable in many ways: "What is said to be capable is in one way what has a starting-point of movement or change. . . . And in another way if something else has a capacity of this sort with regard to it. And in another way if it has the capacity to change into something, whether for the worse or the better. . . . And in another way, if neither another thing nor the thing itself insofar as it is other has a capacity or a starting-point that is destructive of it. Further, all of these are said to be capable of something either merely because the thing might happen to come about or not to come about, or because it might do so *well*. . . . Incapacity is lack of capacity, that is, lack of the sort of starting-point that has been described, either generally or by what naturally should have it, or even by what at the time should naturally already have it. For a boy, a man, and a eunuch would not in the same way be said to be incapable of begetting children. Further, to each of the two sorts of capacity there is an opposite incapacity—both to what can merely produce movement and to what can produce movement well. Some things, then, are also said to be incapable in virtue of this sort of incapacity, whereas others are in another way both capable and incapable, namely [possible and impossible], where an impossible thing is that of which the contrary is of necessity true. For example, it is impossible for the diagonal to be commensurable, because something like that is a falsehood whose contrary is not only true but also necessary. Hence that it is commensurable is not only false but of necessity false. . . . The contrary of this, the possible, is found whenever it is not necessary that the contrary is false. . . . In one way, then, the possible, as was said, signifies what is not of necessity false; in another what is true; and in another what admits of being true" (*Met.* V 12 1019^{a}33–^{b}33). The aim here is to exclude the case in which something is incapable of X-ing simply because it is difficult for it to X, or takes a long time for it to X. See *Ph.* V 2 226^{b}10–14.

Note 669

Whether one and the same change in the following way, namely, so as to unlimited in time or not should be investigated: As it is more fully at VII 7 261^{a}27–8 265^{a}12.

Book VII

Note 670

Book VII: VII 1–3 exist in two versions, labeled α and β. OCT prints α as the preferred text, with β appended (as VII 3 is in the Appendix here), with new line numbers to avoid confusion between the two. Books V, VI, VIII form a unified discussion, parts of which are often referred to as—or as included in—"our accounts concerning movement (*ta peri kinêseôs*)." *Ph.* VI is referred to in this way at VIII 8 263^{a}11–12, *APo.* II 12 95^{b}11, *Sens.* 6 445^{b}20, *Met.* IX 8 1049^{b}36; *Ph.* VIII at *Cael.* I 5 275^{b}22, *GC* I 3 318^{a}3). Book VII interrupts this sequence, suggesting that it may have been incorporated into the *Physics* at a later date. See Ross, pp. 11–19, and, on VII 3, Maso, especially, pp. 131–136.

Note 671

A good to a bad that are not different in species: "Good is said of things in as many ways as being. For it is said of things in the category of what it is (for example, the god and the understanding), in that of quality (the virtues), in that of quantity (the moderate amount), in that of relation (the useful), in that of time (the opportune moment), in that of place (a livable dwelling), and so on. Thus it is clear that it will not be some common universal—that is, a 'one.' For then it would not be said of things in all the categories but only in one" (*NE* I 6 1096^{a}23–29).
From *this* pale (*toude to leukon*) to *this* dark (*tode to melan*): See I 3 186^{b}7n.

Note 672

These issues were discussed earlier: In V 4.

Note 673

Whether they are equal or greater, in both cases the whole movement is unlimited (for we are assuming what admits of being so to be so): The assumption is that $M_1M_2M_3M_4$ is unlimited. It cannot be then that M_3M_4 and so on are less than M_1M_2 (the movements of A and B), since then $M_1M_2M_3M_4$ would not be unlimited (III 6 206^{b}7–12). Thus M_3M_4 and so on must be equal to or greater than M_1M_2.

Note 674

So there would be an unlimited movement in a limited time, which is impossible: See VI 7 238^{a}32–^{b}22.

Note 675

What in a primary way causes movement: The primary mover is now not the first in a chain of movers but the last one, which directly moves what it moves. See VII 2 244^{b}16–245^{b}2.

What in a primary way causes movement with respect to place and with a bodily movement must either be in contact with or be continuous with what is moved: What is being excluded by the phrase "with a bodily movement" is the case in which a thing that is not itself in movement produces movement by acting on desire or understanding: "the primary [mover] of all is the object of desire, since it moves things without being moved, by being understood or imagined" (*DA* III 10 433^{b}11–12).

Note 676
Since we are taking what admits of being so to actually be so: See VII 1 242^{b}47–50n.

Note 677
In a limited time either what is limited or what is unlimited goes through an unlimited movement, which in both cases is impossible: See VI 7 238^{a}32–^{b}22.

Note 678
The hypothesis that was taken: See VII 1 242^{b}47–50n.

Note 679
Together (*hama*): See IV 6 213^{b}8n.

Note 680
Packing and combing (*spathêsis kai kerkisis*): *Spathêsis* is pushing the weft thread together in weaving, *kerkisis* is pushing apart the warp threads to allow the shuttle containing the weft threads to pass between them.

Note 681
Except for the ones that are involved in coming to be and passing away: On Aristotle's view comings to be and passings away are not movements (V 1 225^{a}12–^{b}9). Hence he must distinguish the sorts of aggregation and disaggregation involved in these from the ones that are in fact movements. See also I 4 187^{a}31.

Note 682
At the same time it is evident that there is no other genus of movements but aggregation and disaggregation: Reading ἢ σύγκρισις καὶ διάκρισις with Hardie & Gaye and the mss. for OCT ἡ σύγκρισις καὶ διάκρισις, which gives the meaning: "It is evident that aggregation and disaggregation are not even a distinct genus of movements." The β version of VII has: "And indeed every movement with respect to place is an aggregation and disaggregation" (244^{a}1).
They are all divided into the ones mentioned: At VII 2 243^{a}16–17.

Note 683
When the movement of what is pulling: Reading τοῦ ἕλκοντος with P; OCT secludes.
Is faster than the one that would separate the continuous things from each other: The continuous things are the puller and the thing it is pulling. The

movement that would separate them is the natural resistance of the thing being pulled, which tends to disconnect it from what is pulling it.

Note 684

It is not in this way that wood pulls fire: The natural movement of fire is upward, whereas the burning wood, though stationary, seems to pull it toward itself. Aristotle's response is that it pulls the fire to where it is, whereas a puller that is in movement pulls a thing toward where it was just before. Magnetic attraction (discussed at VIII 10 266^b27–267^a20, especially 267^a1) presents greater difficulties for Aristotle's principle that mover and moved must be making contact.

Note 685

244^b5a–5d: Added in OCT to fill a lacuna in the transmitted text.

The same ones to a greater or lesser degree (*tô[i] mallon kai hêtton*): See V 2 226^b2n.

Note 686

They are affections of the relevant underlying quality: That is they are determinates of the determinable quality—on which, see I 2 185^a23n(3).

Note 687

Color is continuous with the light, and the light with the sight: "This is what the being is for color, namely, to be capable of causing movement in what is actively transparent; and the actualization of the transparent is light. . . . [And] seeing comes about because the part that can perceive is affected by something. Now it cannot be affected by the color that is being seen [since it is at a distance]. It remains, then, for it to be affected by what is intermediate, so that there must be something intermediate [namely, light]" (*DA* II 7 419^a10–20).

Note 688

It is the same way with hearing and smelling, since the first mover relative to what is moved is the air: "The same account applies to both sound and odor [as to seeing]. For none of these produces perception when it touches the perceptual organ. Instead, due to odor and sound, what is intermediate is moved, and, due to this, each of the perceptual organs" (*DA* II 7 419^a25–28).

Note 689

In the case of tasting the flavor is together with the capacity of taste: "Flavor is one of the objects of touch" (*DA* II 3 414^b11), and so affects the capacity of smell directly, without the need of a medium like air or light.

Note 690

The mover that is primary, or last in relation to the moved: Suppose M is the moved and that is moved by M_1 which is moved by M_2 which is moved by M_3. Relative to M, M_1 is the last in the chain of its movers, and so is its primary—in the sense of direct—mover.

Note 691

VII 3: The alternate text of VII 3 is translated in the Appendix.

Note 692

The others: That is, the attributes that are not perceptible, in the sense of not being the special objects of any of the perceptual capacities: "By a special object I mean whatever cannot be perceived by another perceptual capacity, and about which we cannot be deceived—for example, sight is of color, hearing of sound, taste of flavor, whereas touch has several different ones. At any rate, a given perceptual capacity is discerning about these, and does not make errors about whether there is color or whether there is sound, but rather about what the colored thing is or where it is, or what the thing making the sound is or where it is. Things like these, then, are said to be special objects of a given perceptual capacity, whereas those that are said to be common are movement, rest, number, shape, and size, since things like these are special to no perceptual capacity but common to all. For indeed movement is perceived by touch and by sight" (*DA* II 6 418^{a}11–20).
States: See I 4 188^{a}7n.

Note 693

These two: That is, figures and shapes on the one hand, and states on the other.

Note 694

Paronym: See III 7 207^{b}9n.
We do not say that the statue is bronze, or the candle wax, or the bed wood, but changing the form of the name, that they are brazen, waxen, or wooden: "As for that from which, as matter, they come to be, some, when they have come to be, are said not to be *that* but *thaten*—for example, a statue is not said to be stone, but stony. The human being who is healthy, by contrast, is not said to be of that from which he comes. The cause of this is that although he comes to be from both the lack and from the underlying subject, which we call the matter (for example, it is both the human and the sick that come to be healthy), it is rather from the lack, nevertheless, that he is said to come to be—for example, healthy comes from sick rather than from human. That is why the healthy one is not said to be sick, but is said to be human, and the human is said to be healthy. In cases where the lacks are unclear or nameless, however, such as the lack of whatever shape it happens to be in bronze, or that of a house in bricks and timbers, the thing seems to come to be from these materials as in the previous case it did from being sick. That is why, just as in that previous case the thing is not said to be what it is from, so in these cases too the statue is not said to be wood (*xulon*), but by derivation, wooden (*xulinos*), and brazen, not bronze, and stonen, not stone, and the house is said to be bricken but not bricks. But it is not the case either that a statue *comes to be* from wood, or a house from bricks, since if someone looked intensely, he would not say this unconditionally, because what something comes to be from must change, and not remain. That, then, is why we speak in this way" (*Met.* VII 7 1033^{a}5–23).

Note 695

Referring homonymously to the matter by using [the name of] the affection: See III 3 202^{a}28n.

Note 696

Virtue (*aretê*), **vice** (*kakia*): Anything that has a function (*ergon*) has a correlative *aretê*, which ensures that the function is performed well, and a correlative *kakia*, which ensures that it is performed badly. Thus it is possible to speak of the *aretê* of thieves, scandalmongers, and other bad things that are good at doing what they do (*Met.* V 16 1021^{b}17–20), as well as of the *aretê* of non-living tools and instruments. For this reason *aretê* is sometimes translated as "excellence" and *kakia* as "defect."

Note 697

Virtue is a sort of completion (*teleiôsis*): "Virtue is a sort of completion. For each thing is complete and every substance is complete when, as regards the form of its proper virtue, it lacks no part of its natural magnitude" (*Met.* V 16 1021^{b}20–23).

Then it is most of all in accord with its nature: Reading τὸ with P; OCT secludes.

Note 698

All virtues are in [the category of] being related in a way to something: Virtue and vice as genera are relatives (*Cat.* 7 6^{b}15–16), but the particular virtues (courage, temperance) and vices (cowardice, intemperance) are qualities, as is true of states generally 8 11^{a}23–32 (quoted in 247^{b}2–3n).

All virtues are in [the category of] being related in a way to something (*en tô[i] pros ti pôs echein*): "We call relatives (*pros ti*) all such things as are said to be just what they are, *of* or *than* other things, or in some other way in relation to something else. For example, [a] what is larger is said to be *than* something else, since it is said to be larger than something, and [b] what is double is said to be *of* something else, since it is said to be double of something. Similarly with all other such cases" (*Cat.* 7 6^{a}36–^{b}2).

Note 699

Health and good condition [lie] in (*en*) **a blending and proportion of hot and cold things, either of one in relation to another within the body or to what encompasses it:** Health and good condition, insofar as they are bodily conditions, are a blending or proportion, but regarded as conditions also of the soul (or of the animal), they are probably more like anger as described at *DA* I 1 403^{a}25–28 (quoted in II 9 200^{b}7–8n). See also IV 3 210^{b}22–27.

Note 700

Each is in [the category of] being related in a way to something: Reading ἐν for OCT ἐστι.

Note 701

Relatives are neither themselves alterations nor is there alteration, coming to be or in general any change whatsoever of them: See V 2 225^{b}11–13n.

Note 702

For example, hot, cold, dry, and wet things, in whatever it may be that these states first reside: Just as the heart is the first thing to come to be in embryogenesis, so it is in the appropriate proportional blend of hot, cold, dry, and wet things that health and other bodily virtues first reside. See *GA* II 1 735^{a}14–26 (quoted in VI 9 240^{a}24–25n).

Note 703

In such-and-such a way (ὡδὶ): Other mss. have ὡς δεῖ (“as it should”).

Note 704

When pleasure and pain come to be, virtue and vice come to be as well (for they are concerned with these): “We must take the pleasures and pains that supervene on a person’s works as a sign of his states. For someone who abstains from bodily pleasures and enjoys doing just this is temperate, whereas someone who is annoyed is intemperate, and someone who endures terrible things and enjoys doing so—or at least is not pained by it—is courageous, whereas someone who is pained is cowardly. For virtue of character is concerned with pleasures and pains. Indeed, it is because of pleasure that we do base actions and because of pain that we abstain from doing noble ones. That is why we must be brought up in a certain way straight from childhood, as Plato says, so as to enjoy and be pained by the things we should, since this is what the correct education is. Further, the virtues are concerned with actions and feelings, and every feeling and every action entails pleasure and pain. . . . Again, it is because of pleasures and pains that people become base—by pursuing and avoiding these, either the ones they shouldn’t or when they shouldn’t or in the way they shouldn’t or in whatever other ways are distinguished in the account. . . . Hence we may take it that virtue is the sort of state concerned with pleasures and pains that is a doer of the best actions, and that vice is the contrary state” (*NE* II 3 1104^{b}3–28). The idea, we see, is that it is by being *habituated* to be pleased as we should that the virtues of character come to be in us: “So it makes no small difference whether people are habituated in one way or in another way straight from childhood; on the contrary, it makes a huge one—or rather, *all* the difference” (1 1103^{b}23–25).

Note 705

The thought-involving part (*tou noêtikou merous*): Also mentioned at *NE* IX 4 1166^{a}17, where in the next line it is described as “the element with which a person thinks (*phronei*),” which is more narrowly identified a few lines later with the understanding part (*to nooun*) (1166^{a}22) and later still with understanding (*nous*) itself (X 7 1177^{b}26–1178^{a}3)—on which see II 1 193^{a}9n.

Note 706

Very much more [than in the case of the virtues of character] we speak of what has scientific knowledge as belonging in [the category of] being related in a way to something: “In pretty much all such things [states, dispositions] the genera are said of things in relation to something, but none of the particular cases is. For scientific knowledge, a genus, is said to be just what it is *of* another thing (it is said

to be scientific knowledge of something), but none of the particular cases is said to be just what it is *of* another thing—for example, grammar is not said to be grammar of something or music music of something. If they too are said to be relative to something at all, it is with reference to the genus—for example, grammar is said to be scientific knowledge of something, not grammar of something, and music is said to be scientific knowledge of something, not music of something. So the particular cases are not relatives" (*Cat.* 8 11^a23–32; also *Top.* IV 4 124^b18–19). By contrast, we do not speak of virtue as being in the relevant way *of* some thing.
What has scientific knowledge (*to epistêmon*): That is, what is in the state of having it.

Note 707

When the particular comes to be present, the universal is in a way scientifically known by means of the particular: "Scientific knowledge, like knowing scientifically, is twofold, one potential, the other active: the capacity [or potential], being as matter, universal and indefinite, is of what is universal and indefinite, whereas the activity, being definite, is of what is definite—being a this something of a this something. But it is only coincidentally that sight sees universal color, because this [particular instance of] color that it sees is *a* color, and so what the grammarian theoretically grasps, namely, this [particular instance of] A, is *an* A" (*Met.* XIII 10 1087^a15–21).

Note 708

We are said to scientifically know and to understand (*phronein*) **as a result of our understanding's having come to rest and to a stop:** "Understanding is more like a sort of rest or a sort of coming to a stop than a movement" (*DA* I 3 407^a32–33). See also *Met.* II 2 994^b24, XI 11 1067^b10–11.
Understand (*phronein*): *Phronêsis* (verb *phronein*) is used (1) in a broad sense to refer to thought or (roughly speaking) intelligence of any sort (as at *Met.* IV 5 1009^b13, 30); (2) in a narrower sense to refer to the distinctively practical wisdom discussed in *NE* VI 5; and (3), the sense relevant here, as equivalent in meaning to *sophia* or theoretical wisdom (*Met.* XIII 4 1078^b15, and throughout *Protr.*). (2), in its fullest form, and (3) are distinctively human possessions. But Aristotle does sometimes attribute a weaker form (*HA* VII 1 588^a18–31) of (1) to non-human animals, such as deer, hare, cranes, bees, and ants (I 2 488^b15, IX 5 611^a15–16, IX 10 614^b18, *PA* II 2 648^a5–8, 4 650^b18–27, *GA* III 2 753^a10–17).
As has also been said earlier: At V 2 225^b15–16.

Note 709

That is also why children are incapable of learning: "Even among human beings, indeed, children . . . though possessing some other exceptional capacity, are inferior in the possession of understanding (*nous*) as compared to adults. The reason . . . is that in many of them the starting-point of the soul is movement-hampered and body-like in quality" (*PA* IV 10 686^b23–28).
Or discerning by means of the perceptible capacities as well as their elders, since the disturbance and movement [in their souls] is great: "A problem might

be raised as to how, when the affection is present but the thing producing it is absent, what is not present is ever remembered. For it is clear that one must understand the affection, which is produced by means of perception in the soul, and in that part of the body in which it is, as being like a sort of picture, the having of which we say is memory. For the movement that occurs stamps a sort of imprint, as it were, of the perceptible object, as people do who seal things with a signet ring. That is also why memory does not occur in those who are subject to a lot of change, because of some affection or because of their age, just as if the change and the seal were falling on running water. In others, because of wearing down, as in the old parts of buildings, and because of the hardness of what receives the affection, the imprint is not produced" (*Mem.* 1 450^{a}25–^{b}5).

It settles down and comes to rest with regard to some things due to nature itself, and with regard to others due to other causes: Nature itself is the cause when the settling down is due to maturation. The other causes include "habit and teaching" (*NE* X 9 1179^{b}20–21).

In either case accompanied by the alteration of certain things in the body: The following passage explains what in the body gets altered and what causes this: "Sleep is not every incapacity of the perceptual faculty, but rather this affection arises from the evaporation that attends eating food. For what is vaporized must be driven on to a given point and then must turn back and change just like the tide in a narrow strait. In every animal the hot naturally rises, but when it has reached the upper parts, it turns back, and moves downward in a mass. That is why sleepiness mostly occurs after eating food, for then a large watery and earthy mass is carried upward. When this comes to a stop, therefore, it weighs a person down and makes him nod off; but when it has actually sunk downward, and by its return has driven back the hot, then sleepiness comes on and the animal falls asleep" (*Somn.* 3 456^{b}17–28). So when there is too much vaporized food present in us it makes us incapable of accessing the intelligible objects in our passive understanding. That is why an understanding that is "understanding nothing . . . would be just like someone asleep" (*Met.* XII 9 1074^{b}17–18). We wake from sleep "when digestion is completed and a large quantity of the heat, which is withdrawn from the surrounding parts is concentrated in a small place, prevails and the more corporeal blood is separated out from the pure blood" (*Somn.* 3 458^{a}10–12).

Note 710

Commensurable: In particular, with respect to speed.

Note 711

Equal speed (*isotaches*): *Isotaches* used here is, as elsewhere, equivalent in meaning to *homotaches* (sameness of speed) used at VII 4 248^{a}11.

Note 712

This is what "faster" was said to mean: At VI 2 232^{a}25–26.

Note 713

A straight line will be equal to a circle. But these are not commensurable: By "circle" we should understand "circular arc," which is a closed segment of a circumference. Euclid's *Elements*, Book III Proposition 2, states that if on the circumference of a circle two points be taken at random, the straight line joining the points will fall within the circle, entailing that no straight line is equal in length to the arc of a circle. This does not entail, however, that the two are incommensurable, or incomparable in length, since one can still be longer or shorter than the other, unless one also supposes, as Aristotle does (VII 4 248^{a}24–25), that if one can be longer or shorter than the other, then they can also be of equal length.

Note 714

It is the things that are not synonymous that are all incommensurable: See VI 3 234^{a}9n.

Note 715

Homonymous things: See III 3 202^{a}28n.

Note 716

"Much" signifies the same in the case of water as in that of air, and these are not commensurable [in this respect]: Suppose "much" is defined as "such-and-such an amount, namely X, plus more" (VII 4 248^{b}18) or "whatever exceeds amount X." Then X will be different, the claim is, for water and air. In the case of water X might be 100 liters, so that there would be much, or a lot, of water in the room if there was more than 100 liters there, whereas in the case of air X might be 1,000 liters.

Note 717

Primary recipient (*proto[i] dektikô[i]*): The recipient of, for example, pale is what the attribute paleness belongs to (I 3 186^{a}31), or what "pale" is predicated of. Since "something's being pale . . . [is] a combination of surface and paleness" (*Met.* VIII 6 1045^{b}15–16), because surface figures in the definition of its essence, surface is the primary recipient of paleness. Surfaces, in turn, are the surfaces of substances, so that Socrates is also a recipient of paleness if his surface is a primary recipient of it.

Note 718

Water and noise (*phônê*) **are not commensurable [in respect to whiteness]:** The adjective *leukos*, unlike its English equivalent "white," can be applied to horses, dogs, water, voiced sound (the actual meaning of *phônê*)—in the latter two cases meaning "clear."

Since what it is [primarily] in is distinct: White water is water whose surface is white, but white noise is not noise whose surface is white.

Note 719

Which of the two is more colored, not with respect to a particular color, but insofar as it is a color: If A and B are colored it must be because their surfaces are of some particular color—for example, white. When we compare A and B with respect to which is whiter, A may be whiter than B. But this does not entail that A is more colored than B. For suppose B is blacker than A. Then, since black and white are both colors, A will be more colored (because whiter) than B and B will be more colored (because blacker) than A.

Note 720

Things have the same speed which in an equal time move such-and-such an equal amount: Reading τὸ ἐν ἴσῳ χρόνῳ κινεῖσθαι with P for OCT τῷ ἐν ἴσῳ χρόνῳ κινεῖσθαι.

Note 721

If, then, in this [time] one [half] part of a thing's length is altered while the other half is spatially moved (εἰ δὴ τοῦ μήκους ἐν τῳδὶ τὸ μὲν ἠλλοιώθη τὸ δ' ἠνέχθη): The clause is difficult. I have taken τῳδὶ to refer to time, but it could also be taken with μήκους and mean "in this (or in a certain) part of its length."

Note 722

So [must we correct our statement and say that] if things in equal time *spatially move* an equal length, they are of equal speed?: The added material helps make explicit the compressed thought. If there are species of movement, as there are of color, then we cannot compare the speeds of movements that are in different ones. And if we try to get around that problem by focusing on one species, such as spatial movement, we run into another, namely, that spatial movement in a circle can be equal in speed to spatial movement in a straight line, entailing that a line can be equal in length to a circle.

Note 723

Or are the two [the movement and the line] together divided in species?: Reading χρόνος ὁ αὐτός τῷ εἴδει ᾖ ἅμα κἀκεῖνα with P and the mss. for OCT χρόνος ὁ αὐτός, ἂν δὲ τῷ εἴδει ᾖ ἄλλα, καὶ ἐκεῖνα ("for the time is the same, and if the lines are different in species, the spatial movements must be so as well").

Note 724

That over which (*eph' hou*) the movement occurs: For example, over a straight path or over a circular one.

Note 725

Is it rather by its shapes that spatial movement is distinguished?: That is, by the different shapes of the path, whether straight, circular, or otherwise, over which it occurs. If flying and walking are different species of spatial movement, there will be an apparent problem involved in saying that they are of equal speed, if indeed movements of different species are incomparable with respect to speed.

Note 726

But what altered (*ti elloiôthê*)? For we cannot speak of equal here, but rather what in [the category of] quantity is equality, is here similarity: In the case of spatial movement we say that if things in equal time spatially move *an equal length* or *equal magnitude*, they are of equal speed. So here length or magnitude is the space of the movement with its associated metric, such as feet or inches. Alteration is change in the category of quality not quantity, however, and while equality applies to quantities, what applies to qualities is not equality but likeness or similarity. So we cannot speak of an equal altering or altering an equal something, as we speak of spatially moving an equal length or distance, but must speak instead of a similar altering or altering a similar something. The initial question asks what that something is, not what the something is that altered (for example, the patients in the medical example), but what the quality space is within which the process of alteration occurs. See V 4 227^{b}23–24n.

Note 727

There is not just one species, any more than there is in the case of spatial movements: See VII 4 249^{a}19–20.

Note 728

One is faster than the other if in an equal time the things that come to be are distinct (*heteron*) (for here we do not have two things between which distinctness is like dissimilarity): Spatial movement occurs in a place and alteration occurs in a quality space (V 4 227^{b}23–24n), what is the equivalent in the case of coming to be and passing away? By analogy with the gestation period in mammals, which varies from species to species (266 days in humans, 645 days in Asian elephants), let us call it a *gestation space*. When in an equal time two members A and B of the same species reach the same stage of development they are coming to be at the same speed. But when B reaches stage S_1 and A reaches a distinct later stage S_2, then A is coming to be faster than B and B more slowly than A. What then is the relation between A's coming to be and B's coming to be, that is like inequality in the case of spatial movement and dissimilarity in the case of alteration? It has, Aristotle says, no name (VII 4 249^{b}23), so he uses *heteron* to refer to it, aware that he is giving it a special sense.

Or, if substance is number, then within the same species one number may be greater than another: Things that unconditionally come to be and pass away are in the category of substance (V 1 225^{a}15–16). If these were numbers, as the Pythagoreans thought (IV 6 213^{b}26n), then when B reaches stage S_1 it will be a smaller number than A, which has already reached S_2.

Note 729

The more and the less: See V 2 226^{b}2n.

Note 730

The half will be done in half the time, or that in half the time the half will be done (τὸ ἥμισυ ἐν ἡμίσει καὶ ἐν ἡμίσει ἥμισυ): Hardie & Gaye, in common with many editors, emend the text to read τὸ ἥμισυ ἐν διπλασίῳ καὶ ἐν διπλασίῳ ἥμισυ ("the half will do so in twice the time or in twice the time half will do so"). I follow Ross in taking τὸ ἥμισυ as object of the verb ἀλλοιώσει (VII 4 250^{b}6) rather than its subject. The claim is then parallel to VIII 3 253^{b}14–26 and the point being made is this: If A produces an alteration or increase of degree n in time t, it need not produce one of degree ½n in ½t, and so on. Nor, conversely, need it in ½t produce one of ½n, and so on.

Book VIII

Note 731

All their theoretical knowledge: Reading τὴν θεωρίαν πάσιν with P and the mss. for OCT τὴν θεωρίαν πᾶσαν.

Note 732

Those who say that there are unlimited cosmoses: For example, Leucippus, Democritus (DK 67A1 = TEGP 1, 68A40 = TEGP 53), and, though less certainly, Anaximander (DK 12A14 = TEGP 18, 12A17 = TEGP 41).
Cosmoses: See II 4 196^{a}25n.
Those who say [1] that there is one cosmos, or [2] one that does not always exist: Rejecting with Graham and P the OCT addition of ἢ ἀεὶ in [2]. The contrast on this reading is between [1] one continuously existing cosmos and [2] one non-continuously existing cosmos. Anaxagoras and Empedocles, discussed in the next paragraph, are examples of [1] and [2] respectively. With the OCT addition the meaning is this: "Those who say that there is one cosmos and make it eternal or not eternal, make movement eternal or not eternal in accord with their account."

Note 733

Anaxagoras . . . says that all things were together and at rest for an unlimited time: See DK B1 = TEGP 11 F1.
And then the [divine] understanding produced movement in them and disaggregated them: See DK B1 = TEGP 33 F16.
Empedocles: Aristotle quotes DK B17.9–13 = TEGP 41 F20 (= DK B26.8–12 = TEGP 50 F27).

Note 734

"From this to that": From a period in which there is rest (when love unites all the elements into a sphere, or when strife disaggregates all of them into separate strata) to one in which there is movement (when strife begins the process of disaggregating the elements from the sphere, or when love begins the process of aggregating them back into a sphere). Not everyone agrees that Empedocles did have the two periods of rest that Aristotle attributes to him.

Note 735

To see the truth will be useful not only to the theoretical knowledge concerned with nature, but also to the methodical inquiry concerned with the primary starting-point: See *Met.* VI 1 1026^{a}6–30, quoted in the Introduction, p. xxi.
Methodical inquiry: See I 1 184^{a}10n.

Note 736

What we previously determined in the *Physics* (*en tois phusikois*): Aristotle sometimes contrasts Book VIII with *ta phusika* or *ta peri phuseôs* ("the [discussions or writings] concerned with nature"), as he here contrasts it with III 1, and with other books at VIII 3 253^{b}8 (Book II), 5 257^{b}1 (Book VI), 10 267^{b}21–22 (Book III again). But these terms have no very fixed reference for him. Thus *Met.* XII 8 1073^{a}32 uses *en tois phusikois* to refer to VIII 8–9. For discussion, see Ross, pp. 1–11.

Note 737
We say, then, that movement is the activation of the movable insofar as it is moveable: At III 1 201^{a}10–11 (with minor differences in wording).

Note 738
Some things move things in only one way, while others do so with contrary movements—for example, fire heats but does not cool, whereas the science of contraries seems to be one science: "And all the capacities that involve reason are such that the very same one is a capacity for contraries, whereas the nonrational ones are such that one capacity is for one of them. For example, the hot is for heating only, but the craft of medicine is for both disease and health. The cause of this is that scientific knowledge is an account, and the same account makes clear both the positive thing and its lack. . . . Now since contraries do not occur in the same thing, and scientific knowledge is a capacity by having an account, and the soul has a starting-point of movement, it follows that while what is healthy produces only health, and what is capable of heating produces only heat, and what is capable of cooling produces only cold, the person with scientific knowledge can produce both of the relevant contraries. For the account concerns both, though not in the same way, and it is in a soul that has a starting-point of movement, so that the soul will move both of the relevant contraries from the same starting-point, having connected them to the same account. That is why things that are capable in accord with an account—in contradistinction to the ones capable without an account—produce contraries. For they are encompassed by one starting-point, namely, the account" (*Met.* IX 2 1046^{b}4–24); "Whichever of two alternatives an agent desires in a controlling way, this it will do, whenever it is such as to be capable and meets up with what is capable of being affected. And so whenever anything that is capable in accord with reason desires what it has a capacity for, in the way in which it has the capacity, it is necessary for it to do this" (5 1048^{a}11–15).

Note 739
He uses his scientific knowledge in the reverse way: "Scientific knowledge is an account, and the same account makes clear both the positive thing and its lack, except not in the same way—that is, in a way it is of both, but in a way it is rather of the positive thing. And so it is also necessary that these sorts of sciences should be of contraries, but of one intrinsically and of the other non-intrinsically. For the account too is of one intrinsically and of the other, in a way, coincidentally. For it is by denial and removal that it makes the contrary clear. For the contrary is the primary lack, and this is the removal of the other [and positive] contrary" (*Met.* IX 2 1046^{b}7–15).

Note 740

How will there be a before and after if time does not exist?: Compare *Met.* XII 6 1071^{b}7–9.

Note 741

If time is really a number of movement or a sort of movement: See IV 11 219^{b}1–2.

Note 742

Plato alone, by contrast, has it come to be: See IV 10 218^{a}33n.

He says that the heaven came to be: "Time, then, came to be together with the heaven, so that just as they were begotten together, they might also be undone together, should there ever be an undoing of them" (*Ti.* 38b).

Note 743

The now: Discussed in IV 13, see also 11 220^{a}4–5.

Note 744

For there is nothing to take (*labein*) in the time (*tô[i] chronô[i]*) beyond the now: The claim might be: (1) The present now is the only one it is possible to take from any interval of time, since the past is no longer there to take and the future is not yet there. Alternatively, the claim might refer not to time generally but to the specific one in question: (2) The time we are to take is the extremity of the one taken as last (that is, the extremity of the time taken as past). As such is an end-point and hence a now. Since a now is a moment without extension, there can be no time to take in it that is beyond it. Since (1) requires us to understand *labein* in an implausibly strong sense, (2) seems preferable.

Note 745

(251^{b}10–28): This section interrupts the main argument of the chapter, and may be either a digression or a later insertion.

Note 746

Those who posit a single starting-point (*archên*) [of movement], such as Anaxagoras: The reference could be to the divine understanding (*archê* = primary cause of movement) or to the one beginning (another meaning of *archê*) of movement, in contrast to the many cyclical beginnings recognized by Empedocles.

Note 747

Either an induction or a demonstration: See I 2 185^{a}14n (induction), I 1 184^{a}10n (demonstration).

Note 748

The being for: See I 2 185^{b}22n.

Note 749

Of starting-points that are eternal there is no other cause: "If there is something that is capable of moving things or acting on them, but that is not actively doing so, there will not [necessarily] be movement, since it is possible for what has a capacity not to activate it. There is no benefit, therefore, in positing eternal substances, as those who accept the Forms do, unless there is to be present in them some starting-point that is capable of causing change. Moreover, even this is not enough, and neither is another substance beyond the Forms. For if it will not be active, there will not be movement. Further, even if it will be active, it is not enough, if the substance of it is a capacity. For then there will not be *eternal* movement, since what is potentially may possibly not be. There must, therefore, be such a starting-point, the very substance of which is activity. Further, accordingly, these substances must be without matter. For they must be eternal, if indeed *anything* else is eternal. Therefore they must be activity" (*Met.* XII 6 1071^{b}12–22)

Note 750

The [puzzles] that go contrary to these claims are not difficult to resolve (*luein*): That "puzzles" in particular is to be understood is evidenced by the use of the verb *luein* and by VIII 3 253^{a}30–32.

Note 751

Will become clearer from what we say later that some movement can be continuous and eternal: See VIII 8.

Note 752

Sleep: See VII 3 248^{a}6n.

Note 753

But in fact about these issues too things will be evident from what follows: See VIII 6 259^{b}1–16. VIII 2 253^{a}1–2 refers us forward in the same way.

Note 754

The starting-point of our investigation will also be the very one having to do with the puzzle that has just been mentioned: Reading ἔσται ἥπερ with P for OCT ἥπερ. See VIII 2 253^{a}5–7 (= [2]).

Note 755

Just as in accounts concerned with mathematics objections to starting-points are not directed against the mathematician: See I 2 184^{b}25–185^{a}5n.

It is a hypothesis for him that nature is a starting-point of movement: See II 1 192^{b}20–23.

A hypothesis: "Hypotheses are the starting-points of [scientific] demonstrations" (*Met.* V 1 1013^{a}16).

Note 756

Our methodical inquiry: See I 1 184^{a}10–16n.

Note 757

In the Physics: See VIII 1 251^{a}8–9n.

And likewise movement as something caused by nature: Reading ὁμοίος with P and the mss. for OCT ὅμος.

Note 758

Increase and decrease cannot go on continuously, but there is also what is intermediate: For example, a human being grows until it reaches maturity, stays in that condition for some time, and then eventually begins to decline toward death.

Note 759

The case of hauling a ship: See VII 5 250^{a}17–19.

Note 760

Earth and each of the other elements necessarily remain in their proper places: See III 5 205^{a}10n.

Note 761

We see the sorts of changes we mentioned: That is, from being at rest to being in movement, and vice versa.

Note 762

This account does away with coming to be and passing away: Because nothing can be continuously (or always) either coming to be or passing away, but must at some point have come to be and at another have passed away (VI 7 238^{a}18–19). In this regard coming to be and passing away are like increase and decrease (253^{b}13–14).

Note 763

Movement seems to pretty much everyone to be *a sort of* coming to be and passing away: Although, strictly speaking it is not one. See V 1 225^{a}12–34.

Note 764

If something changes to this, it comes to be this (*touto*)**, or in this** (*en toutô[i]*): *Touto* in the case of alteration and increase and decrease; *en toutô[i]* in the case of spatial movement, or movement with respect to place.

Note 765

We have said earlier that it is not possible for all things to be at rest: At VIII 3 253^{a}32–^{b}6.

Note 766

Even if things are truly in this state, as certain people assert, and being is unlimited and immovable: The reference is to Melissus. See I 2 185^{a}32, 3 186^{a}16.

Note 767

Imagination and belief seem to be sorts of movements: Aristotle agrees with this in the case of imagination (*DA* III 3 428^{b}11). In the case of beliefs, this is not so clear: "statements and beliefs, by contrast, themselves remain entirely immovable" (*Cat.* 5 4^{a}34–35); "Everything about which there is belief is already determined" (*NE* VI 9 1142^{b}11–12).

Note 768
To seek an argument when we are too well off to need an argument is to be a bad discerner of what is better and what is worse: "It is lack of educatedness (*apaideusia*) not to know what things we should look for a demonstration of and what things we should not. For it is in general impossible to demonstrate everything (for it would go on without limit, so that even then there would be no demonstration)" (*Met.* IV 4 1006^{a}5–9); "Regarding every sort of theoretical knowledge and every methodical inquiry, the more humble and more estimable alike, there appear to be two ways for the state to be, one that may be well described as scientific knowledge of the subject matter, the other a certain sort of educatedness. For it is characteristic of a person well educated (*pepaideumenos*) in that way to be able accurately to discern what is well said and what is not. We think of someone who is well educated about the whole of things as a person of that sort, and we think that being well educated consists in having the capacity to do that sort of discerning. But in one case, we consider a single individual to have the capacity to discern in, so to speak, all subjects, in the other case, we consider him to have the capacity to discern in a subject of a delimited nature—for there might be a person with the same capacity as the person we have been discussing but about a part of the whole. So it is clear in the case of inquiry into nature too that there should be certain defining marks by reference to which we can appraise the way of its demonstrations, separately from the question of what the truth is, whether thus or otherwise" (*PA* I 1 639^{a}1–15).

Note 769
It is likewise impossible for all things to be in movement or for some things to be always in movement and the others always at rest: See VIII 3 253^{b}6–254^{a}1, 254^{a}3–15.

Note 770
With respect to their parts: See V 1 224^{a}24–26.

Note 771
What is moved due to itself is moved by nature: Compare II 1 192^{b}23–27, 8 199^{b}31.

Note 772
Contrary to [1] their [normal] positions and [2] modes of movement: [1] For example, when a human being walks on his hands; [2] when he rolls along rather than walking.

Note 773
Those we last distinguished: At VIII 4 254^{b}20–22.

Note 774
They would have been capable of stopping themselves: Reading αὐτὰ with P for OCT αὐτὰ αὐτά.

So that if it is up to fire itself to spatially move upward, it is clear that it is up to it to spatially move downward as well: Since moving in the opposite direction is not the same as stopping, it is not clear why Aristotle thinks that being able to stop entails being able to move in the opposite direction.

Note 775

It is also unreasonable for things to move themselves with only one sort of movement, if at any rate they do move themselves: Animals move themselves only with spatial movement, the other sorts of change they are involved in not being up to them (VIII 6 259^{b}6–11). So we should not expect earth or fire to be any different, were they self-movers. What is unreasonable, then, is to suppose that each would by nature spatially move itself in only one way, namely, down or up, and not in the large variety of ways in which animals spatially move.

Note 776

A lever . . . is not capable by nature of moving what is heavy: A lever causes upward movement not by its own nature but by its downward movement (which is caused by something outside it) and by its position relative to the fulcrum and the thing it moves. What is actively hot, by contrast, by nature heats up other things that have the potential to be hot.

Note 777

The same thing may have a quality and a quantity, but the one might belong to the other coincidentally and not intrinsically: In the process of acquiring a certain quality a thing might coincidentally acquire a certain quantity, or come to be in a certain place, but this is irrelevant to its transition from potentially possessing the quality to actually possessing it.

Note 778

Always when what is capable of affecting and what is capable of being affected come together, sometimes the potential becomes active: Reading γίγνεται ἐνίοτε ἐνεργείᾳ τὸ δυνατόν with P and most mss. for OCT γίγνεται ἐνεργείᾳ τὸ δυνατόν (“always when what can act and what can be affected come together, the potential becomes active”). Their coming together is necessary but not sufficient for the activation of the capacity.

The one who has scientific knowledge but is not contemplating (*theôrôn*) **is in a way potentially a scientific knower:** Already acquired scientific knowledge when activated is contemplation. See I 1 184^{a}10n (scientific knowledge), 7 189^{b}32n (contemplation).

Note 779

The light comes to be from the heavy (for example, air from water): See IV 5 213^{a}2–4n.

Note 780

The activity of the light is to be somewhere (namely, up): “The spatial movement of each body toward its own place is spatial movement toward its own form” (*Cael.* IV 3 310^{a}33–34).

Note 781

This is the being for the light and the heavy: See I 2 185^{b}22n.
The one being determined by up and the other by down: See III 5 205^{a}10n.

Note 782

A quantity is at once expanded: As what is normally a certain size expands to fill out a place when it is no longer compressed.

Note 783

Removes a stone from a wineskin in the water: The wineskin is full of air, like a balloon, and is being held underwater by a stone, whose removal in a way causes the wineskin to float to the surface.

Note 784

Contrary to nature and by force: See VIII 4 254^{b}24–27.
Things moved by nature: See VIII 4 254^{b}27–33.
Those not moved by themselves: See VIII 4 254^{b}33–255^{b}31.
They are moved . . . by what caused them to come to be and made them light or heavy: That is, the hot substance that made a potentially hot thing actually hot, or the cold thing that did the same to a potentially cold thing. See VIII 4 255^{a}22–23, ^{b}8–11.

Note 785

[1] it is not through itself that the mover moves the thing: Reading δι᾽αὑτὸ with P and the mss. for OCT δι᾽ αὐτὸ.
Or [2] it is through itself, and this latter mover will act either [2a] first after the last movement or [2b] through several [intermediates]: Starting from the thing X whose movement is the last one, work back through the chain of X's movers, we either come first to [2a] what moves it through itself or [2b] after going through several intermediate movers.
A human being is no longer moved by anything else: "Of action, then, the starting-point—the source of the movement, not what it is for the sake of—is deliberate choice, and of deliberate choice, the starting-point is desire and reason that is for the sake of something . . . and this sort of starting-point is a human being" (*NE* VI 2 1139^{a}31–^{b}5).

Note 786

What is coincidental is not necessary, but admits of not being: The coincidental is focally discussed in *Met.* VI 2–3.

Note 787

It was shown previously that there must always be movement: In VII 1.

Note 788

The movers and the moveds must be making contact with each other up to a certain point: As the hand that throws a ball remains in contact with it until the point when it lets it go.

Note 789
Immovable: See I 2 184^{b}16n.

Note 790
What is moved by another and not by itself: Reading ὑπ’ ἄλλου δὲ ἀλλ’ οὐχ ὑφ’ αὑτοῦ with P for OCT οὐχ ὑπ’ ἄλλου δὲ ἀλλ’ ὑφ’ αὑτοῦ (“what is moved by itself and not by another”).

Note 791
Anaxagoras speaks correctly: “It [the understanding] must, therefore, since it understands all things, be unmixed, as Anaxagoras says, in order that it may master them—that is, in order that it may know them. For something foreign intruding into it impedes and obstructs it. So too it must have no other nature than this, that it is potentially something. That part of the soul, therefore, that is called the understanding (and I mean by the understanding that by which the soul thinks and grasps things) is actively none of the beings before it [actively] understands them. That is why it is reasonable that it should not be mixed with the body, since it would then come to be of a certain sort, either cold or hot, or it would have some instrument as the perceptual part does, whereas, as things stand, it has none” (*DA* III 4 429^{a}18–27).
When he says that the [divine] understanding is unaffectable and unmixed: At DK B12 = TEGP 31 F15.

Note 792
So that it is in accord with the same species of movement: Reading ὥστε with P and the mss. for OCT ὥς γε.

Note 793
As we said earlier: At VIII 5 257^{a}7–12.

Note 794
What is itself intrinsically a cause is always prior as a cause: Reading αἴτιον ἀεὶ πρότερον with Simplicius, Graham, and the mss. for OCT ἀεὶ πρότερον αἴτιον.

Note 795
It was shown previously that everything that is intrinsically moved is continuous: At VI 4 234^{b}10–20.
In our universal discussions about nature (*en tois katholou tois peri phuseôs*): See Book VII headnote, I 2 185^{a}20n.

Note 796
It was determined that it is the movable that is moved: At VIII 1 251^{a}9–16.

Note 797
Movement is the incomplete actualization of what is moveable: Compare III 1 201^{a}10–11, 3 202^{b}27–28.

Note 798

The mover, on the other hand, is already in activity—for example, what is hot heats, and in general what has the form begets [something that has] it: "It is evident that the substance and the form are activity" (*Met.* IX 8 1050^{b}2–3). See II 7 198^{a}25–27.

Actuality . . . activity: See I 2 186^{a}3n.

Note 799

Likewise in each of the other cases in which the mover and the moved must be have the same name: "In a way all things come to be from something with the same name, just as in the case of the ones that do so by nature" (*Met.* VII 9 1034^{a}22–23). See also VIII 4 255^{a}21–23.

Have the same name (*sunônumon*): See VI 3 234^{a}9n.

Note 800

With either both parts making contact with each other, or one of the two with the other: If mover and moved are both bodies, they must be making contact with each other if one is to affect the other (VII 1 242^{b}59–63). But if one of them is a soul, this need not be so: "For the most part, no doubt, when one thing makes contact with another, the latter makes contact with it. For in fact pretty much all the things within our experience move things by being moved, and in their case what makes contact must, and evidently does, make contact with something that makes contact with it. Yet it is possible, as we sometimes say, for the thing that moves something to make one-way contact with what it moves, and for what makes the contact not to be made contact with by what it contacts. Nevertheless, it seems that making contact must be reciprocal, because what moves something belongs to the same kind (*genos*) as what it moves. So if anything immovable causes movement, it may make contact with what it moves, while nothing makes contact with it. For we sometimes say that grief makes contact with [or touches] us, but not that we make contact with it. The contact present in natural things may be determined in this way" (*GC* I 6 323^{a}26–34). Similarly, an object of appetite or desire can cause movement without itself being in movement. See *Met.* XII 7 1072^{a}25–27.

Note 801

What is moved must of course be continuous: See VI 4 234^{b}10–20 (referred to at VIII 5 257^{a}34).

Note 802

If when divided it no longer has the same nature: In the case of A having the same nature would involve having the capacity to be an immovable mover of B, in the case of B it would involve having the capacity to be moved by A.

Note 803

Whether it is moved by something that moves itself and stops itself: See VIII 4 255^{a}6–9.

Note 804

There must always be movement without intermission: See VIII 1.

Note 805

Perhaps it is necessary, if something without parts at one time is and another time is not, that anything of that sort should, without undergoing any process of change, at one time be and another time not be: In fact, Aristotle thinks that nows (*Met.* III 5 1002^{b}6–7), points (VIII 5 1044^{b}22), and essences or forms (3 1043^{b}14–18) are like this, as are the various activities or actualities, such as hearing or perceiving (*Sens.* 6 446^{b}2–4).

Note 806

Everything that moves itself must have magnitude, if nothing without parts is in movement, but for the mover to have it is not at all necessary: Begin by granting that some things T can come to be and pass away without undergoing any process of change that requires an antecedent cause (VIII 6 258^{b}16–20). Then grant that some of the starting-points S available as immovable movers to cause eternal movement can be at one time and not at another (258^{b}20–22). Then ask: Is it possible for all the elements of S to be at one time and not be at another? Answer: It is not possible for all of them. Why? Consider the self-movers. Since they are moved movers they must have magnitude (VI 4), and so have parts, and so are not in T. Hence they must have antecedent causes in S of their being at one time and not being at another. So these causes cannot themselves be at one time and not at another, which their status as immovable (and so as not needing to have parts) allows.

Note 807

Nor, again, could one that moves some things, while others move others: Reading οὐδ’ αὖ τῶν ἀεὶ μὲν ταδί κινούντων, τῶν δ’ ἕτερα with P for OCT οὐδ’ αὖ τωνδὶ μὲν ταδί [κινούντων], τούτων δ’ ἕτερα.

Note 808

In things that are by nature what is limited and better must, if it is possible, be present to a higher degree: That is, to a higher degree than their opposites—because nature does nothing pointlessly (for example, *DA* II 5 415^{b}16–17, III 9 432^{b}21, 12 434^{a}31, *PA* I 1 641^{b}12–29). See also I 4 188^{a}17–18, 6 189^{a}14–16.

Note 809

What is successive is not continuous: See V 3 226^{b}34–227^{a}27.

Note 810

The starting-points [of the argument]: The mss. read τὰς ἀρχάς τῶν κινούντων (“the starting-points belonging to the movers”). OCT omits τῶν κινούντων, making the reference be to the argument that begins in VIII 3, which Aristotle in fact proceeds to review.

Note 811

Having established that everything that is moved is moved by something: In VIII 4.

We advanced: In VIII 5.

Note 812

The animate ones: Including the plants.

Note 813

But we must grasp the fact that: Reading δὲ with P for OCT δὴ.

Animals move themselves with only one sort of movement: Namely, spatial movement, or movement with respect to place.

Note 814

When nourishment is being concocted, animals sleep and when it is being distributed [to the various parts] they wake up and move themselves: See IV 5 213^a1–4n (concoction), VII 3 247^b14–248^a6n (sleep, wake up).

Note 815

The mover is something else: That is something in what encompasses the animal, such as food.

Note 816

The first mover and the cause of their self-movement: Namely, the soul, with its perceptual, imaginative, understanding, and desiring parts: "The movement of animals is like that of automata, which are set moving when a small movement occurs: the strings are released and the pegs strike against one another. . . . For animals have instrumental parts that are of the same kind as these, namely, sinews and bones; when these are relaxed or loosened movement occurs. . . . In an animal, however, [unlike in an automaton] the same part has the capacity to become both larger and smaller and to change its shape, as the parts expand because of heat, contract again because of cold, and undergo alteration. Alteration, however, is caused by appearances, sense perceptions, and intelligible objects. For sense perceptions are an immediate kind of alteration, and appearances and intelligible objects have the power of the things themselves [that gave rise to them]. For in a way the intelligible form of the pleasant or painful is like the thing itself. That is why we shudder and are frightened because of understanding on its own. All these are affections and alterations; and when things in the body are altered, some become larger and some smaller. And it is not hard to see that a small change occurring in a starting-point produces great and numerous changes at a distance from it—just as by shifting the rudder a hair's breadth you get a large shift at the prow. Besides, when under the influence of heat or cold or some other similar affection, an alteration is produced in the region of the heart, even in an imperceptibly small part of it, it produces a large difference in the body—blushing, for example, or turning white, as well as shuddering, trembling, and their opposites" (*MA* 7 701^b1–32).

Note 817

The body changes its place, so that what is in the body does so as well, and moves itself by means of leverage: The soul moves from place to place—in which it is coincidentally located (IV 5 212^b11–12) by, for example, moving the body from place to place in the way described in the previous note.

Note 818

The things that are [intrinsically] immovable but are themselves moved coincidentally: Reading αὐτῶν κινουμένων with P and most mss. for OCT αὐτὰ.

Note 819

If being itself is to remain in itself and in the same: Compare Parmenides DK B8.29–30 = TEGP 17 F8. 29–30, Xenophanes DK B26.1 = TEGP 38 F26.1.
In the same: That is, within the same limits.

Note 820

To be moved by [1] something else belongs even to some starting-points in the heaven, namely, those [2] that are spatially moved with several spatial movements, whereas [3] to be moved coincidentally by itself belongs only to things that pass away: The reference in [2] is to the sun, moon, and planets, which have complex orbits, in contrast to those of the so-called fixed stars. The reference in [1] is to the celestial spheres in the surface of which these heavenly bodies are set. These spheres are members of a set of spheres, each member of which has its poles set in the surface of the next sphere outside it. *Met.* XII 8 describes the entire system. Since these spheres, like the others in the system, are animate beings, possessed of souls (*Cael.* II 12 292^a14–22), these souls are spatially moved coincidentally by the other spheres in the set and their souls. The contrast in [3] is with mortal terrestrial animals like us whose souls are coincidentally moved when the bodies they themselves animate are spatially moved.

Note 821

What is moved by something that, though it is moved, is moved directly by what is immovable, because it is related to things now in one way now in another, will not be the cause of the same movement, but instead, because of being in contrary places or forms, it will produce contrary movements in each of the other things that it moves and cause it at one time to be at rest and at another time in movement: "Since we have posited and shown that things are subject to continuous coming to be and passing away, and since we say that spatial movement is the cause of coming to be, it is evident that if the spatial movement is one, it will not be possible for both processes to occur, because they are contraries. For what is the same, and remains in the same state, by its nature produces the same thing, so that either coming to be or passing away will always occur. And so the spatial movements must be more than one and must be contraries, either because of the direction of their movement or because of its irregularity, since contraries have contraries as their causes. That is why it is not

the sun's primary spatial movement that is the cause of coming to be and passing away, but that in the inclined circle. For in this there is both continuity and being moved in two movements. For if coming to be and passing away are always to be continuous there must on the one hand be something that is being moved, so that these changes do not fail, and on the other hand two movements, in order that not only one of the two processes will occur. The spatial movement of the whole [that is, the primary heaven—the ethereal sphere of the fixed stars], then, is the cause of the continuity, whereas the inclination is the cause of the approach and retreat. For this results in its becoming further away at one time and closer at another, and since the distance is unequal the movement will be irregular. So, if it causes coming to be by approaching and being close, this same thing causes passing away by retreating and becoming further away; and if it causes coming to be by repeatedly approaching, it also causes passing away by repeatedly retreating. For contraries have contraries as their causes, and natural passing away and coming to be occur in equal periods of time. That is what the times—that is, the lives—of each sort of thing has a number that determines it" (*GC* II 10 336^{a}23–^{b}12). See also *Met.* XII 6 1072^{a}10–17.
Because of being in contrary places or forms (*eidos*): Since the heavenly bodies undergo only one sort of change, namely, change with respect to place (or spatial movement), they cannot change their form, species, or any of their intrinsic qualities. The reference, therefore, must be such things as the changing inclination of the sun.

Note 822
The puzzle we raised at the start: At VIII 3 253^{a}22–24.

Note 823
We must investigate whether it is possible for any sort of movement to be continuous or not, and if it is possible, what sort it is: See VIII 7 261^{a}27–265^{a}12.

Note 824
What increases is in one way increased by what is like itself, but in another way by what is unlike itself. For contrary is said to nourish contrary. But everything gets added by becoming like to like: "But a puzzle arises. For while some people say that like is nourished by like, just as with growth, others think the reverse, as we said, that it is contrary by contrary—the supposition being that like is unaffectable by like, whereas nourishment changes and gets concocted, and in every case change is into the opposite or into the intermediate. . . . But whether the nourishment is the final state of the thing added or the first makes a difference here. For if both are nourishment, but one is un-concocted and the other concocted, it would be possible to speak of it as nourishment in both ways. For insofar as the nourishment is un-concocted, contrary is nourished by contrary, whereas insofar as it is concocted, like is nourished by like. So it is evident that in a way both speak correctly and in a way incorrectly" (*DA* II 4 416^{a}29–^{b}9).

Note 825

This change to a contrary: The change in the nourishment from being unlike what it nourishes (un-concocted, undigested) to be like what it nourishes (concocted, digested).

Note 826

Making the actively hot from the potentially hot: As is required for the concoction of nourishment. See IV 5 213^{a}1–4n.

Note 827

The starting-point of all affections is condensation and rarefaction. For heavy and light, soft and hard, hot and cold, seem to be sorts of density or rarity. And condensation and rarefaction are aggregation and disaggregation, in virtue of which substances are said to come to be and pass away: "So it is clear that something is said to be in that many ways too. For a threshold *is* because it is placed thusly, and the being for a threshold signifies its being placed thusly, and the being for ice signifies its being solidified thusly. And in some cases their being will even be defined by all of these, due to some parts being mixed, some blended, some bound, some solidified, and some making use of the other differentiae, as do hand and foot. We must, then, get hold of the kinds (*genos*) of the differentiae—for these are going to be starting-points of the being. For example, the ones differentiated by the more and less, or by dense and by rare, or by others of this sort. For all these are [kinds of] excess and deficiency. And if something is differentiated by shape, or by smoothness and roughness, all these are differentiated by [kinds of] straight and curved. And for other things being is being mixed and not being is the opposite. From these cases, then, it is evident—if indeed its substance is the cause of each one's being—that it is in these differentiae that we must look for what the cause is of the being of each of them" (*Met.* VIII 2 1042^{b}25–1043^{a}4). If our text is making a cognate point, it is not claiming that the affections (the attributes involved in alteration) are reducible to rarefaction and condensation, but that the latter are the kinds or genera to which the affections belong. And indeed this is all that is required for the argument, since its goal is simply to show that alteration presupposes change with respect to place, not that one *is* the other. The *Metaphysics* text also suggests, however, that rarefaction and condensation may be no more than one of the genera into which the affections fall. But, again, this is sufficient for Aristotle's argument here.

Note 828

What is said to be prior is [1] that without which the other things will not exist, whereas it can exist without them, and there is also [2] priority in time and [3] with respect to substance: In his focal discussion of priority and posteriority in *Met.* V 11, Aristotle makes [1] equivalent to [3]: "Others, however, are said to be prior in nature and substance, when it is possible for them to be without other things, but not the others without them" (1019^{a}2–4). And there [2] is explained as follows: "Others things are prior in time, some by being further from now, as in the case of things that come to be (for the Trojan Wars are prior to the Persian because they are further from now), some by being closer to now, as in the case of things that are to come (for the Nemean Games are prior to the Pythian because they are closer to now, treating now as starting-point and first)" (1018^{b}14–19). In our text, however, [1] and [3] are distinguished, with [3] (explained at VIII 7 261^{a}13–26) and [2] (explained at 260^{b}29–261^{a}12) understood differently.

Note 829

We always suppose the better to exist in nature, if it is possible: See VIII 6 259^{a}10–12n.

That it is possible for movement to be continuous will be shown later: In VIII 8.

Note 830

What begets is the cause of what is begotten: That is what antecedently has the completed form (and so is not coming to be as something that has it) begets what will have it. See VIII 5 257^{b}10.

Note 831

What comes to be is incomplete and proceeds to a starting-point, so that what is posterior in order of coming to be is prior in nature: "The things that are posterior in coming to be are prior in form and in substance—for example, man to boy and human to seed (for the one already has the form, while the other does not)—and . . . everything that comes to be proceeds toward a starting-point and an end (for the for-the-sake-of-which is a starting-point, and the coming to be is for the sake of the end)" (*Met.* IX 8 1050^{a}4–9).

Note 832

Some living things are entirely without movement due to a lack of the [requisite] instrumental part, such as plants and many genera of animals: Reading τοῦ ὀργάνου with P; OCT secludes. "Some animals are stationary, others move about. The stationary ones are found in water, whereas no land-animal is stationary. But in the water we find many that live by sticking fast to something—for example, many kinds of shellfish do this. The sponge even seems to have a sort of perception" (*HA* I 1 487^{b}6–10). See also *PA* IV 7 683^{b}9–10.

Note 833

The truth of the assumption we made both just now and previously—namely, that it is possible for there to be a movement that is continuous and eternal: At VIII 7 260^{b}23 (just now) and VIII 3 253^{a}29 (previously).

Methodical inquiry: See I 1 184^{a}10n.

Note 834

Defining marks: See II 8 199^{b}6n.

Note 835

It is likewise too in the case of changes: At VIII 7 261^{b}1–3 Aristotle deals with movements, which are from contrary to contrary. He now switches to consider changes (coming to be, passing away) that are not movements, and are from contradictory to contradictory. See V 1 225^{a}34–^{b}9.

Note 836

Passing away and coming to be, whether unconditionally or a particular sort in relation to a particular sort, are opposites: See I 7 190^{a}31–^{b}10, V 1 225^{a}13–20.

Note 837

What is in spatial movement in a limited straight line is not in continuous spatial movement: Unlimited movement in a straight line is impossible, because no magnitude is actually unlimited. See III 5, 8.

Note 838

We have previously determined what the one and continuous movement is: In V 4.

Note 839

We saw that there were three things: At V 4 227^{b}21–228^{a}6.

Human or god: Aristotle recognizes the existence of a number of different divine beings or gods, among which he distinguishes a primary god, referred to as *ho theos* ("the god"), which is the one referred to as the immovable mover in *Ph.* VIII 10 and more fully discussed together with the other divine beings in *Met.* XII 7–10.

Note 840

Whereas lateral movement is not contrary to upward movement: Since they do not destroy or prevent each other.

Note 841

One may be convinced that such movement must come to a stop not only on the basis of perception but also on the basis of argument: Aristotle often conjoins an appeal to perception (here, appearances) with an appeal to argument, or to things that are in accord with argument (*kata ton logon*) or in accord with reason. See (among many other examples) *Cael.* I 5 272^{a}5–6, II 13 293^{a}29–30, 14 297^{b}18–30, *Mete.* II 5 362^{b}14–19, *PA* II 8 653^{b}19–30, III 4 666^{a}13–18, *EE* I 6 1216^{b}26–28, *Pol.* VII 4 1326^{a}27–28, 7 1328^{a}20–21. The argument in question, as here, typically appeals to general principles relevant to the subject matter under consideration, but is seldom if ever a demonstration from scientific starting-points.

Note 842

The mid-point [M] is both end-point [E] and starting-point [S] in relation to the other two, and is one in number, but two in account: M is one point in number, but relative to S it is an end-point, and relative to E it is a starting-point, and so it is two in account.

Note 843

Potentially is distinct from actively: See I 2 186^{a}3n.

Note 844

But whenever . . . : Reading δὲ with P and the mss. for OCT δὴ ("whenever, then, . . .").

Just as one might do by understanding it that way: See VIII 8 263^{a}23–^{b}3.

Note 845

A is the point it has departed from as a starting-point: Aristotle uses A and later D and G, to refer both to points and to the objects that begin or end their spatial movements at them.

Note 846

Therefore, A has not arrived at and departed from B at the same time: Reading ἄρα with P and the mss. for OCT γὰρ ("for A has not arrived . . .").

Note 847

In our first accounts concerned with movement: VI 2 233^{a}21–31, VI 9.

Note 848

In our accounts just now: At VIII 8 262^{a}19–^{b}21.

Note 849

This already belongs to the later period: Reading τὸ ὕστερον with P and the mss. for OCT τοῦ ὑστέρου.

Note 850

C . . . is the first time at which it is true to say that the thing is white or that it is not white: Up to now Aristotle has been describing a case of change from white to not white (passing away). This disjunctive formulation generalizes his discussion to cases of change from not white to white (coming to be).

Note 851

Contiguous or successive: See V 3 226^{b}34–227^{a}12.

Note 852

It is evident that if D was coming to be white in the whole time A, there is no time in which it has come to be white and was coming to be white that is greater than the whole time in which it only was coming to be white: On the view under analysis there are no indivisible times, and so no nows or temporal points, as Aristotle understands them. But D, he says, is and comes to be white at precisely such a temporal point, namely, the extreme point of A—call it t_e. His argument now is that A + t_e cannot be a greater period of time than A, as it would have to be if there were no temporal points, but only divisible temporal intervals. Considered as a point, of course, t_e belongs "as far as the thing is concerned" to the later interval it defines (VIII 8 263^{b}10–11), but considered as an interval it does not.

Note 853

Logico-linguistically: See III 3 202^{a}22n.

Note 854

We saw that there are no others beyond these: In V 2.

I mean the ones that are distinct in species, not if some part of the whole is: The contrast is between a case in which X was not always in movement with a movement of species S, and a case in which though X was not always in such movement one of its parts was always in movement of some sort. So if X is an animal, its heart may always be beating, but it need not always be in movement with respect to place. So if it is in movement with respect to place now, it must have been at rest with respect to place previously, though not necessarily in other species of rest.

Note 855
The white (*to leukon*): See I 3 186^{b}7n.

Note 856
How could the extreme point of contraries—for example, of whiteness and blackness—be the same? For the change from being white to being black to be continuous, the extreme or last point of being white, P, would have to be the same as the first point of being black (V 2 227^{a}10–12). But then the thing undergoing the change would have to be both back and white at P, which is impossible, since whiteness and blackness are contraries.

Note 857
A straight line . . . has contraries with respect to place: See VIII 8 261^{b}34–36.
They are contrary only if they are along a straight line: Contrariety is "a sort of greatest difference"—for example, where "the distance between the extremes is greatest" (*Met.* X 4 1055^{a}3–9). Thus on a straight line AB, A is contrary to B, since the distance between them is greatest (*Ph.* V 3 226^{b}32–33), and so movement from A to B is contrary to movement from B to A. Contrariety is thus a sort of opposition (*Met.* X 4 1055^{b}1).
And opposite if they are along the same line: Suppose AB is the arc of a circle greater than a semicircle, then movement from A to B is opposite to movement from B to A, but since the distance between A and B is not the greatest one, the movements are not contrary.

Note 858
Circular movement is never in the same things (*en tois autois*), **whereas rectilinear movement is repeatedly in the same things:** The things in question must, it seems, be the starting-point and end-point (or limit) of the movements, since it is the fact that these are united in the case of circular but not rectilinear movement that makes the former continuous and the latter not (VIII 8 264^{b}27–28). To say that a movement is *in* these, however, is not to say that it is between them, but that it has its coming to be in them (264^{b}21–22). Thus what makes circular movement continuous is that its starting-point now comes to be in one thing (one point on the circumference) now in another, and that this is also its end-point (since the two are united), so that these movements are never contraries or opposites. In the case of rectilinear movement, on the other hand, the starting-point and end-point are repeatedly the same and are repeatedly the contraries of the starting-point and end-point of the next movement in the sequence. At each stage, therefore, a movement changes to its contrary movement or change (264^{b}25–27). As a result, the sequence of movements cannot constitute one continuous movement.

Note 859

The starting-point and limit are not united, whereas in circular movement they are, and it alone is complete: "If indeed by complete we mean a thing outside which nothing can be found, as was said earlier [at *Ph.* III 6 207^{a}8–10], and if something can always be added to a straight line but never to a circle, it is evident that the line that encompasses a circle is complete" (*Cael.* II 4 286^{b}18–22).

Note 860

Things are always in flux: Aristotle describes Plato as being familiar from youth with "Cratylus and the Heraclitean beliefs that all perceptibles are always flowing" (*Met.* I 6 982^{a}32–34).

They speak even of coming to be and passing away as alteration: See I 4 187^{a}30n, referring to Anaxagoras.

Note 861

As we said earlier: At VIII 8 261^{b}29.

Note 862

An unlimited straight line does not exist: See III 5, 8.

Note 863

The complete is prior to the incomplete, in nature, and in time: On these sorts of priority, see VIII 7 260^{b}17–19n. Priority in substance there is priority in nature here.

In account: A is prior in account to B if the account of A figures in the account of B, but not vice versa. See *Met.* VII 1 1028^{a}34–36. Thus what is complete (*teleion*) is prior in this way to what is incomplete, or not complete (*ateles*), because it is obvious that the latter is defined in terms of the former.

And what is incapable of passing away to what is capable of passing away: "Eternal things are prior in substance to things that pass away, and nothing eternal exists potentially. Here is the reason. Every capacity [or potentiality] is at the same time for something and for the contradictory. For while what is incapable of belonging cannot belong to anything, everything that is capable admits of not being active. So what is capable of being admits both of being and of not being. So the same thing is capable both of being and of not being. But what is capable of not being admits of not being. And what admits of not being can pass away, either unconditionally or in that way in which it is said to admit of not being, namely, with respect to place, or to quantity, or to quality—'unconditionally' is 'with respect to substance.' So none of the things that cannot unconditionally pass away are unconditionally potential (although nothing prevents one from being so in a certain respect—for example, with respect to quality or place). So all of them are actively [what they are]. Nor are any of the necessary beings potential ones (and yet these are primary things, since if they were not, nothing would be). Nor, then, is movement potential, if some movement is eternal" (*Met.* IX 8 1050^{b}6–20).

Note 864

The center-point of a sphere is starting-point, mid-point, and end-point of the magnitude: The idea is perhaps this. If a sphere is defined as the locus of points equidistant from an internal fixed point (the center), then the center is a starting-point, in the sense that it is the starting-point of (the construction of) the sphere, as of course is the circumference, since its distance from the center is also definitive of the sphere, as Aristotle recognizes at VIII 10 267^{b}6–7. Since the radii converge at the center it is also the point to which the sphere contracts, and is in that sense its end-point. It is a mid-point, since it is in the middle of the sphere.

Note 865

And because of this, the whole is in a way always at rest and remains, and is also always in continuous movement: Reading διὰ τὸ τοῦτο μένειν with P and most mss. for OCT διὰ δὲ τὸ τοῦτο μένειν ("and because [the center] remains, the whole is in a way always at rest and always in continuous movement").

Note 866

Because the revolution is also the measure of movements: See IV 14 223^{b}18–23. **Everything is measured by what is primary:** "The being for one is . . . most of all the being for a first measure of each genus, and, in the fullest way, of that of quantity. For it is from this that it has been extended to the other kinds. For a measure is that by which quantity is known, and a quantity insofar as it is a quantity is known either by a one [or a unit] or by a number, and all number by a one, so that all quantity insofar as it is quantity is known by the one, and what quantities are primarily known by, this is itself one. That is why the one is the starting-point of number insofar as it is number. And, by extension from this, so too in the other genera what is said to be a measure is the primary thing by which each is known, and the measure of each thing is a one [or a unit], in length, in breadth, in depth, in weight, in speed" (*Met.* X 1 1052^{b}16–27).

Note 867

Regular (*homalês*): See V 4 228^{b}15–25.

Note 868

Has them outside: Namely, at the center (VIII 9 265^{b}4).

Note 869

Aggregation and disaggregation are movements with respect to place: The reference is to Empedocles. See VIII 1 250^{b}26.

Note 870

The [divine] understanding, Anaxagoras says, disaggregates things as the first cause of movement: See I 4 187^{a}21, VIII 1 250^{b}24.

Note 871

Those who say that things are in movement because of the void: The reference is to the atomists Leucippus and Democritus. See IV 6 213^{b}2–22.

Note 872

Movement because of the void is spatial movement and, as it were, with respect to place: Movement in a void is only as it were with respect to place, because an Aristotelian place must be encompassed by body, not void. See IV 4 212^{a}5–6. **Primary things:** Namely, atoms or "indivisible bodies" (VIII 9 265^{b}29).

Note 873

Those who make condensation and rarefaction the cause of coming to be and passing away: See I 4 187^{a}12–16.

Note 874

Those who make soul the cause of movement: Plato and the Platonists.

Note 875

They say that what moves itself is the starting-point of all things that are in movement: "All soul is immortal. For what is always in movement is immortal, and what moves something else and is moved by something else, in ceasing from movement, ceases to have life. Only what moves itself, because it does not abandon itself, never stops moving. But it is also source and starting-point of movement for the other things that move" (Plato, *Phdr.* 245c); "What is the account, then, of this thing to which the name 'soul' is given? Do we have any besides what was just now said, 'the movement that is capable of moving itself'?" (*Lg.* 895e10–896a).

Note 876

It will cause [D] to move in half the time, namely, t_2t_3: Reading κινήσει χρόνῳ with P for OCT χρόνῳ.

Note 877

Among the beings there must be continuous movement: See VIII 1–2.

Note 878

To cause movement in this way involves no labor: "The ancients assigned the heaven—that is, the upper region—to the gods, on the supposition that it alone is immortal. And the present account does testify that it cannot pass away or come to be, and, further, that it is unaffected by any mortal troubles, and that, in addition, it involves no labor, because it needs no forceful necessity to constrain it and prevent it from traveling in another way that is natural to it. For everything of that sort involves labor—the more so, the more long-lasting it is—and is without a share in the best disposition" (*Cael.* II 1 284^{a}11–18); "That is why the sun, the stars, and the whole heaven are always active, and there is no fear that they may some time stand still, which is what those concerned with nature fear, nor do they get tired doing this. For movement is not for them connected with a capacity for the contradictory, as it is for things that can pass away, so that the continuity of the movement is laborious, since the substance that is matter and potentiality, and not activity, is what causes this" (*Met.* IX 8 1050^{b}22–28).

Note 879

These are a circle's starting-points: See VIII 8 265^{b}2–3n.

Note 880
Where [the movement caused is] continuous by being successive: Reading συνεχής with P for OCT συνεχῶς.

Note 881
As was mentioned a moment ago in the case of projectiles: At VIII 10 $266^{b}28$–$267^{a}8$.

Note 882
That there cannot be an unlimited magnitude was shown previously in the *Physics*: In III 5. See also VIII 1 $251^{a}8$–9n.
It has been shown just now: At VIII 10 $266^{a}12$–$^{b}6$.

APPENDIX

Note 883
VII 3 (alternate text): See Book VII headnote. The Greek text translated is Version β, Maso, pp. 28–33.

Glossary of Greek Terms

ἀΐδιος	eternal
αἰσθάνεσθαι	perceive
αἴσθησις	perception, perceptual capacity
αἰτία, αἴτιον	cause
ἀκίνητος	immovable
ἀλήθεια	truth
ἀλλοίωσις	alteration
ἅμα	at the same time, together with
ἀνάγκη	necessity
ἀντικείμενος	opposite
ἀόριστος	indefinite
ἄπειρος	unlimited
ἁπλῶς	unconditionally, simply
ἀπόδειχις	demonstration
ἄτομος	indivisible
ἀπορία	puzzle
ἀρετή	virtue
ἀρχή	starting-point
ἀφορίζειν	determine, define
ἀφωρισμένος	indefinite

βίᾳ	force

γένος	genus, kind
γένεσις	coming to be
γνῶσις	knowledge

δεικνύειν	show
δηλοῦν	make clear
διαίρεσις	division
διάνοια	thought

διαφορά	differentia, difference
διϊέναι	traverse
δόξα	belief
δύναμις	capacity, potential
εἰδέναι	know
εἶδος	form, species, kind
ἐναντίος	contrary
ἐνέργεια	activity
ἐνεργείᾳ	actively
ἐντελέχεια	actuality
ἐντελεχείᾳ	in actuality
ἕξις	state
ἐπιστήμη	science, scientific knowledge
ἔργον	function, work
θεωρεῖν	contemplate, get a theoretical grasp on
θεωρία	contemplation, theoretical knowledge
ἰδέα	(Platonic) Idea
καθ’ αὑτό	intrinsic
καθ’ αὑτὸ συμβεβηκός	intrinsic coincident
καθ’ ἕκαστον	particular
καθόλου	universal
κακία	vice
κατὰ συμβεβηκός	coincidentally
κινεῖν	move, cause movement
κίνησις	movement
κρίνειν	discern, judge
κύριος	strict, control
λόγος	account, argument, reason
μεταβολή	change
μεταξύ	intermediate

μονάς	unit
μορφή	shape
νοεῖν	understand
νοητός	intelligible
ὄν, ὄντα	being, beings, what is, what are
ὄρεξις	desire
ὁρίζειν	determine, define
ὁρισμός	definition
ὅρος	definition, term, defining mark
οὗ ἕνεκα	for-the-sake-of-which
οὐσία	substance
πάθος	attribute, affection
παρά	beyond
πέρας	limit
σημαίνειν	signify
στέρησις	lack
στοιχεῖον	element
σοφία	theoretical wisdom, wisdom
συλλογίζεσθαι	deduce
σχῆμα	figure
σῶμα	body
τέλειος	complete
τέλος	end
τέχνη	craft
τί ἐστι	what-it-is
τί ἦν εἶναι	essence
τόδε τι	this something
τύχη	luck
ὕλη	matter
ὑποκείμενον	underlying subject

φορά	spatial movement
φρόνησις	practical wisdom
φύσις	nature
χωρίς	separate
χωριστός	separable
ψυχή	soul

Further Reading

A detailed and regularly updated bibliography of works on Aristotle's *Physics*, compiled by Istvan Bodnar, is available online at: http://plato.stanford.edu/entries/aristotle-natphil/

Also relevant is the entry "Aristotle on Causality" by Adrea Falcon: http://plato.stanford.edu/entries/aristotle-causality/

Thesaurus Linguae Graeca (http://www.tlg.uci.edu) has excellent searchable Greek texts and English translations of Aristotle's writings, with linked dictionaries and grammars.

Editions of the *Physics*, translations of it, commentaries on it, and other works referred to in the notes are listed under Abbreviations.

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